Towards a Tonal Analysis of Free Stress

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Andrei Dubina

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Promotor: Prof. dr. Haike Jacobs

Copromotor: dr. Ben Hermans (het Meertens Instituut te Amsterdam)

Manuscriptcommissie:

Prof. dr. Carlos Gussenhoven

Prof. dr. Jerzy Rubach (Universiteit van Warschau, Polen; University of Iowa, USA)

Prof. dr. Tobias Scheer (Université de Nice-Sophia Antipolis, Frankrijk)

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Andrei Dubina

born on May 12, 1974

in Brest, Belarus.

Supervisor: Prof. Dr Haike Jacobs

Co-supervisor: Dr Ben Hermans (het Meertens Instituut, Amsterdam)

Doctoral Thesis Committee:

Prof. Dr Carlos Gussenhoven

Prof. Dr Jerzy Rubach (Warsaw University, Polen; University of Iowa, USA)

Prof. Dr Tobias Scheer (Université de Nice-Sophia Antipolis, France)

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Acknowledgments

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Abstract

In this thesis, we argue that a strictly tonal, non-accentual analysis is applicable to a wider range of suprasegmental phenomena than usually assumed. The bulk of the work is dedicated to East Slavic stress. A tonal analysis of Belarusian stress is developed in contraposition to the existing analyses of Russian, in particular the OT analyses in Alderete (1999) and Revithiadou (1999). The tonal model can successfully handle the same scope of data as the competing accounts, which are based on accentual representations. The significance of this result for the typology of word prominence lies in the demonstration that, contrary to Hyman's (2006) assertion, languages like Russian ***do*** lend themselves to an analysis in purely tonal terms, if one accepts, as van der Hulst (1999) does, that the phonetic exponents of phonological tone may be other than pitch (*cf*. Lockwood, 1983).

Another interesting result is internal to Optimality Theory. Namely, the adoption of tonal representations has resulted in a 'simplification' of processing: the analysis involves only the most basic mechanisms of input-output correspondence and employs standard constraints or families of constraints used in the analysis of tone. No constraints are lexically indexed; as a rule, they do not refer to any morphological information except for morpheme boundaries. By, contrast, Alderete (1999) employs Transderivational Anti-Faithfulness constraints, controversially positing an output-output correspondence between word forms that are related morphologically but not derivationally; in addition, morphemes that trigger anti-faithfulness are diacritically marked as such. Revithiadou's (1999) analysis heavily relies on an entire family of positional faithfulness constraints and on the proposal – which, as we argue, is incorrect for East Slavic – that the accentual behaviour of a morpheme is dependent on whether or not it constitutes the morphological head of a given word.

As far as the analysis itself is concerned, one of the most interesting results is that accentual dominance is no longer seen as a diacritic property of the respective morphemes. It is proposed that the difference between the accentual behaviour of dominant accented and recessive accented suffixes follows from the difference in the association status of the underlying high tone: the input of a dominant suffix contains a pre-linked tone, while that of a recessive suffix contains a floating tone. Thanks to the constraint against the delinking of tone, a pre-associated tone is intrinsically more stable: its

deletion involves the delinking as well as the deletion of the tone feature. The deletion of an underlyingly floating tone involves only the deletion of the feature itself. It would be of interest to see whether the same kind of analysis can be applied to other systems with accentual dominance/recessiveness, e.g. to Japanese.

Another appealing result of the feature-based model of East Slavic accentuation is that now the realization of word prominence over two syllables (the stressed and the immediately pretonic one) can be seen as a result of feature spreading, essentially identical with the anticipatory high-tone spreading in Serbo-Croatian and some Bantu systems.

In addition to East Slavic stress, we explore the possibilities of the tonal model in the analysis of Proto-Indo-European athematic nouns. The analysis is performed in contraposition to the accentual analyses in Kim (2002) and Frazier (2006). Again, the tonal model can successfully handle the same scope of data and the adoption of tonal representations results in 'simpler' processing.

Finally, the tonal model of prominence is applied to the redistribution of length in Slovak. It is proposed that the shortening of long nuclei next to other long nuclei can be seen as an OCP-type process rather than a metrical one (*cf.* Mellander, 2003), as long as one allows for a tonal representation of Slovak length. The tonal analysis successfully captures the fact that both the progressive shortening (the so-called Rhythmic Law) and the regressive shortening (before the suffixes *-ár/-iar* and *-ák*) are part of the phonological conspiracy to eliminate sequences of long nuclei. In this respect, the analysis is superior not only to the metrical approach but also to the cyclic analysis in Rubach (1993). Further, we propose that the suffixes *-ár* and *-ák*, which trigger but do not undergo shortening, occupy the same position in the phonology of Slovak length as the dominant accented suffixes in the East Slavic system of accentuation.

The tonal model of free stress entails a strong prediction that free stress of the East Slavic type is incompatible with any lexical tone whose presence and/or melody is unpredictable and thus must be encoded in the input.

0. Introduction

One of the fundamental distinctions made in the typology of stress is that between ***fixed*** stress and ***free*** stress. In the most elementary case, the locus of stress in fixed-stress systems can be determined by means of 'syllable counting.' Thus, in Hungarian, stress is invariably assigned to the first syllable, whereas in Polish – to the penultimate syllable.[1] The position of stress in these languages is fixed relative to one of the word edges: the left edge in Hungarian and the right edge in Polish. In Latin, stress is seemingly not fixed, as it varies between the penultimate and antepenultimate syllable. The variation, however, is by no means arbitrary. In a word of more than two syllables, the penultimate syllable can only bear stress if it is heavy; otherwise stress is assigned to the preceding, antepenultimate syllable (Allen, 1973; Jacobs, 2000). Generally, an analysis of a fixed-stress system involves establishing whether stress is aligned with the left edge of the word or the right edge and determining the required distance between this edge and the stressed syllable. More often than not, the location of stress in such systems is surface-predictable, although sometimes factors like morpheme boundaries, etc. have to be taken into account. One of the most significant characteristics of fixed stress is that it is not contrastive. Indeed, words of identical segmental composition always have the same syllabic composition; therefore, in a fixed-stress system, such words will necessarily have the same locus of prominence, unless some morphological factors intervene.

There are languages in which the syllabic composition of a word is not sufficient to determine the locus of stress or indeed is totally irrelevant to stress assignment. In Tagalog, main stress in non-prefixed words can be either on the final or on the penultimate syllable (French, 1988). Despite the apparent similarity to Latin, the choice between these two positions does not depend on syllable weight, so words of identical syllable structure or even segmental composition may potentially differ with respect to the position of primary stress. In East Slavic languages, the position of stress is not limited in any way at all. To be more precise, any given word form is always stressed on one and the same syllable, bar accentual variation, but the location of stress cannot be

[1] The prescriptive norm in Polish is to have antepenultimate stress in a number of borrowings: *'opera, 'prezydent, 'fizyka*.

predicted on the basis of the word's syllabic composition. As a result, words of identical syllable structure or even segmental composition may bear stress on different syllables.

Consider the following examples from Belarusian, one of the three East Slavic languages (all the substantives are in the nominative, unless specified otherwise; adjectives are given in the masculine singular form; the number of nouns is indicated in the glosses): *'stałɨ* 'constant, stable'; *sta'łɨ* 'tables'; *'rukʲi* 'arms'; *ru'kʲi* 'arm' Gen. Sg; *'ɣɔrat* 'city'; *pa'rat* 'parade'; *da'rɔɣa* 'road'; *dara'ɣʲi* 'dear'; *'dɔraɣa* 'dearly'; *ɣała'vɨ* 'head' Gen. Sg; *ɣa'łɔvɨ* 'heads'; *pa'ɣɔračkamʲi* 'hill' dim., Instr. Pl.; *mała'ʁʲiła* 'flapper (part of a flail)'; *kraka'ʤʲiłamʲi* 'crocodile' Instr. Pl.; *namʲɛnkła'tura* 'nomenclature'; *kalʲɛktivʲi'zaʦija* 'collectivization'; *pała'vʲinačkaju* 'half' dim. Inst. Sg.

It is easy to see that stress is not fixed to any particular location. It is word-initial in some of the words, word-final in others, and penultimate, post-initial or antepenultimate in yet others. In the last example, *pała'vʲinačkaju*, stress is on the third syllable from the beginning (or pre-antepenultimate, if counted from the end). The examples *'ɣɔrat* and *pa'rat*, both non-derived masculine nouns of identical syllable structure, show that syllable weight is not a factor. The examples *'stałɨ* and *sta'łɨ* show that words of an identical segmental composition[2] can be contrasted by stress. In *'rukʲi* and *ru'kʲi*, the location of stress serves to differentiate number/declension forms of the same noun.

Contrastiveness of stress is often seen as the defining property of free-stress systems. Now, although stress is contrastive in Tagalog as well as in Belarusian, its location in Tagalog is limited to the last two syllables of a word. As we have just seen, stress in Belarusian is not limited to any particular position or positions in a word; in this sense, it is free. In what follows, our usage of the term 'free stress' will be limited to stress which is contrastive, weight-insensitive, and whose position is not fixed relative to word edges. This usage covers e.g. Belarusian but not Tagalog.

The bulk of the present work is devoted to the free-stress systems of Belarusian and Russian. References to Russian are inevitable, as data from this language constitute the basis of most existing analyses of East Slavic stress. The choice of the stress system of Belarusian as the subject of our own analysis was dictated not only by a better control of the respective data but also by the fact that the accentual system of Belarusian is demon-

[2] Underlyingly, the root vowels are different: //ɔ// in *sta'łɨ* and //a// in *'stałɨ*.

strably more regular than that of Russian. At the same time, the two languages are related closely enough to assume that the same or similar tools can be employed in the analysis of their accentual systems. We could therefore perform our analysis of Belarusian against the solid background of the existing work on Russian. Additionally, we show how our model can be used to account for the accentuation of Indo-European athematic nouns and, more controversially, for length alternations in Slovak, primarily under the celebrated Rhythmic Law.

Efforts have been made to maintain the uniformity of terminology used in the thesis. Lapses, however, are unavoidable, considering the ambiguity of usage in the literature. The term ***accent*** constitutes an especially telling example. In the study of intonation, accents (or pitch accents) are intonational tones 'that are associated with the primary stressed syllables of some words' (Gussenhoven & Jacobs, 2011, p. 155). In tonology, an accent is 'a place marker for the insertion of a tone or word melody' (Gussenhoven, 2004, p. 36). In metrical phonology, the term can have a similar meaning, but this time an accent marks the potential location of stress (*cf.* Melvold 1990). In Fox (2000, p. 115), the word 'accent' is used 'to refer to the linguistic phenomenon in which a particular element of the chain of speech is singled out in relation to surrounding elements, irrespective of the means by which this is achieved.' Van der Hulst (2010) and Hyman (2006) seem to use the word in a similar sense. Lunt (2001, p. 249) distinguishes accent from stress in the following way: '*Accent* is an underlying property of morphemes; *stress* is a phonetic manifestation.' This is the definition to which we adhere in the present thesis. Other uses of the term 'accent' appear mostly in quotations or in discussions of the existing literature. The same applies to the word 'accented.' As a matter of convenience, we use the familiar term ***pitch-accent languages*** on more than one occasion. Problems connected with this term will be touched upon in the concluding chapter. Also as a matter of convenience, we employ the traditional cover term 'Serbo-Croatian' to refer to the majority languages spoken in Bosnia-Herzegovina, Croatia, Montenegro, and Serbia.

In **Chapter 1**, we review several analyses of Russian accentuation, which will serve as points of reference for our own analysis of Belarusian. Two of these works are performed in rule-based frameworks (Halle, 1997; Melvold, 1990). Melvold's thesis remains the most comprehensive generative account of the stress system of Russian, and the concepts and solutions proposed therein will be referred to throughout the text. Halle's analysis is novel with respect to the analysis of the post-accenting pattern.

The remaining works reviewed in the first chapter are performed within the framework of Optimality Theory. We conduct a detailed critical assessment of the influential analyses of Russian stress developed in Alderete (1999 [2001]) and Revithiadou (1999). Alderete postulates the post-stem stress default for Russian and analyzes stress mobility and accentual dominance as based on output-output anti-faithfulness constraints. We demonstrate that some of the inputs he uses in the analysis of the accentuation of derived nouns are incompatible with his own account of the accentuation of non-derived nouns. We also show that, from the vantage point of Alderete's model, there is no clear evidence for the ability of recessive suffixes to support accentual contrasts, his claims to the contrary notwithstanding. Further, we demonstrate that, given Alderete's model, certain facts from the accentuation of derived nouns must be interpreted in such a way that every recessive suffix has a dominant allomorph or, alternatively, that all Russian suffixes are dominant, some of them having recessive allomorphs. Finally, we argue that the application of a solution based on output-output anti-faithfulness to the accentuation of feminine pattern C nouns is problematic.

The work by Revithiadou is of particular relevance to our analysis, as we elaborate upon her proposal that the accentual properties of Russian morphemes are encoded with a 'tone-like feature.' Much of her analysis is based on the idea that morphological hierarchy is directly translatable into prosodic hierarchy. Namely, accents supplied by morphological heads prevail over accents supplied by other morphemes. In a derived word which contains a category-changing suffix, this suffix constitutes the morphological head. If a word is non-derived or if it does not contain a category-changing derivational suffix, its morphological head is the root. In terms of Melvold's (1990) analysis, category-changing suffixes are dominant, and non-category-changing (e.g. evaluative) ones are recessive. We show that dominant evaluative suffixes *do* exist in Russian and point out that, according to Melvold, some category-changing suffixes are recessive, which means that Revithiadou's generalization is too strong. Further, we identify several problems connected with her proposal that the input-output mapping of accents is partially determined by HIERAL, a constraint which requires that words have ideal prosodic structure. Next, we examine the arguments in favour of iterative trochaic footing in Russian put forward by Revithiadou and conclude that there is no clear evidence for such footing. We criticize the proposal that non-head suffixes constitute bimoraic units together with inflectional endings, pointing out that some endings are bimoraic themselves.

Finally, two articles are reviewed. Crosswhite *et al.* (2003) report on the results of an experimental study of the accentuation of nonce words by speakers of Russian and propose the stem-final stress default for Russian. Gouskova (2010) adduces evidence from the accentuation of Russian compounds and proposes that Russian has two stress defaults: word initial and word final, the latter applying on a morpheme-specific basis.

Chapter 2 is devoted to the accentuation of non-derived nouns in Belarusian. We begin with a presentation of the respective accentual patterns based on the existing literature (Biryla, 1986; Loban, 1957; Stankiewicz, 1993). As part of the presentation, we discuss synchronic variability of stress patterns showed by masculine nouns and suggest that it may depend on the frequency of learners' exposure to either the singular or the plural paradigm of a given word. No such variability is reported for non-derived feminine a-stem nouns. The accentual class of a native feminine a-stem noun can be unambiguously determined on the basis of any single form: if a given singular form is stressed on the root, the plural is stressed on the same syllable (Class A), if it is stressed on the ending, then the plural is stressed on the last syllable of the root (Class D). This highly regularized system of the accentuation of feminine nouns is a characteristic feature of Belarusian. We argue that Biryla's (1986) decision to classify non-derived feminine *singularia tantum* nouns stressed on the endings as belonging to the post-accenting Class B must be rejected on systemic grounds. According to the current prescriptive norm, some countable feminine nouns borrowed from Russian (mostly of Turkic origin) are stressed on the ending both in the singular and in the plural, and must therefore be classified as belonging to the post-accenting Class B. However, Loban's (1957) observation that such nouns, despite being countable prescriptively, are only used in the singular is still valid, more than fifty years on. We concur with his generalization that there are only two accentual patterns of non-derived feminine a-stem nouns in Belarusian: pattern A and pattern D.

Next, we develop a tonal analysis of Belarusian accentuation. The analysis is performed in contraposition to the accentual analyses of Russian stress in Alderete (1999) and Revithiadou (1999). This opposition defines the scope of our analysis: the objective is not necessarily to devise the best possible or the most comprehensive analysis; rather, it is to provide a feasible account of a similar set of data. The same opposition determines the use of a comparable OT architecture, the objective being to investigate the consequences of adopting tonal representations rather than to explore the computational power of various revisions of OT. This is the reason why we do not invoke the possibili-

ties offered by some recent versions of OT architecture, such as Optimality Theory with Candidate Chains (McCarthy, 2007) and multi-level varieties of OT: Derivational Optimality Theory (Rubach, 1997, 2000b) and Stratal OT (Kiparsky, 2010b). Our analysis requires only the most basis architecture of correspondence OT and employs standard constraints or constraint types used in the analysis of tone. No constraints are subcategorized for particular morphemes or morpheme classes. The analysis does not require any extensions of Optimality Theory, either standard (positional faithfulness, output-output correspondence) or non-standard (anti-faithfulness). Therefore, one can safely say that, whatever advantages over the competing accentual accounts our model may offer, they are due to adopting tonal representations rather than to any changes in the processing power of the grammar. This in itself is an interesting result, considering OT's *désintéressement* with respect to representations (*cf*. Scheer, 2011).

Following Halle (1971) and Revithiadou (1999), we represent the accentual properties of morphemes with a feature. In Revithiadou's analysis, this 'tone-like' feature comes in two flavours: a strong accent and a weak accent. In pitch-accent systems, the two types of accent are realized in the output as high and low pitch correspondingly. In stress systems, a strong accent is realized as the head of a foot, and a weak accent as the tail of a foot. Any given morpheme can have at most one instance of the feature in the input. When present, an accent feature can be either pre-linked (associated) or floating (non-associated).

We propose that the accentual feature is interpretable directly (without the mediation of a metrical structure) not only in pitch-accent systems but also in free-stress systems. Another crucial difference from the analysis in Revithiadou (1999) is that we make an active use of constraints against the deletion and creation of association lines linking the feature to its host. On a more general level, we suggest that the accentual feature is nothing else but tone, and that, correspondingly, it is represented and processed just like tone in tone systems.

The main properties of the tonal grammar of non-derived nouns are as follows. Input tones are outputted on their source morphemes. If pre-linked in the input, they do not change their host. If floating, they are realized at the left edge of the source morpheme. If both the root and the ending are toneless, the grammar inserts a high tone and aligns it with the right edge of the root. An output may contain one and only one instance of high tone. The location of an output high tone determines the location of the word ictus.

Given that, according to the literature, syllable prominence in Belarusian is realized as duration, an output tone could be directly interpreted as duration by the phonetic implementation component. Alternatively, an output tone could determine the location of the head foot, so that the phonetic implementation component would interpret metrical structure. We assume the first approach, in which output tone is directly interpreted as duration. However, our analysis can accommodate metrical structure, should there emerge convincing evidence for its existence in Belarusian.

The outline of a tonal analysis of the accentuation of Belarusian non-derived nouns is followed by a discussion of how the analysis can be applied to derived words. Since no comprehensive description of the accentuation of derived words in Belarusian is available, we have assumed that a successful model should be able to express the generalizations made with respect to derived words in Melvold's (1990) analysis of Russian. One of such generalizations is the different behaviour of dominant and recessive suffixes. A dominant accented suffix attracts stress irrespective of the accentual properties of the root. A recessive accented suffix is stressed after underlyingly unaccented roots but not after accented ones. We propose that the difference between dominant and recessive suffixes corresponds to the input difference between pre-linked and floating tone.

Finally, we consider the relationship between the default location of stress and the representational complexity of inputs. Most metrical analyses of Russian assume that word forms composed of accentually unmarked morphemes are assigned the default word-initial stress. This is what supposedly happens in certain forms of nouns belonging to the mobile accentual class C. This accentual class, however, accounts for a relatively small percentage of non-derived nouns. Moreover, the accentuation of nonce words by speakers of Russian seems to indicate that the most unmarked pattern for nouns is to have an immobile stress at the right edge of the stem. We discuss how our tonal model can be modified to absorb this observation.

One of the shortcomings of the existing analyses of East Slavic stress is that they do not cover stress-related phenomena, such as vowel duration and vowel neutralization. In **Chapter 3**, we discuss the special status of the immediately pretonic syllable in Belarusian and Russian. The immediately pretonic syllable in both languages is considerably longer than other unstressed syllables. In Russian, the mid back vowel //ɔ// and the low back vowel //a// are generally realized as *schwas* following non-palatalized consonants

in unstressed syllables. However, in the immediately pretonic syllable, this degree of reduction is never attained, and both vowels surface as a centralized allophone of /a/, variously transcribed as [ʌ] or [ɐ]. Alderete (1995) proposes that the immediately pretonic syllable is part of the head foot. Vowels in head feet are protected from the complete loss of articulatory features (that is, from the reduction to *schwa*). Under this analysis, the increased duration of the immediately pretonic syllable is due to the fact that its nucleus is a full vowel rather than a *schwa*. Crosswhite (2000) proposes that only vowels in footed syllables are moraic in Russian and that syllables outside of the head foot remain unfooted and are therefore devoid of moras and reduced. We show that neither analysis can account for Belarusian data.

The fact that the immediately pretonic syllable is the second most prominent one in a word is unexpected from the point of view of any metrical analysis. As Hyman and Schuh (1974) remark, a stressed syllable 'will typically "rob" neighbouring syllables of any stress they may have,' contrary to what the positional faithfulness analysis in Alderete (1995) seems to imply. One of the tenets of metrical phonology and indeed one of its *raisons d'être* is the inability of metrically determined stress to spread. However, the behaviour of the pretonic syllable in Belarusian and Russian is reminiscent of the anticipatory spreading of high tone, which is characteristic of systems where tone has accent-like properties (Hyman, 1978). Anticipatory spreading tallies well with the feature-based (tonal) analysis of Belarusian stress developed in the previous chapter.

Next, we present a consolidated description of an isolated Belarusian dialect which employs both pitch and stress to mark word prominence (Bethin, 2006; Kryvicki, 1959; Vajtovič, 1968; Vojtovič, 1972). In this dialect, if the stressed vowel is high or mid high, the immediately pretonic syllable is considerably lengthened, and the peak of the pitch-contour marking prominence is realized on the pretonic rather than stressed syllable. Although the stressed syllable is less prominent phonetically, there are reasons to believe that it remains the head of the prosodic word. In particular, it is the only syllable that supports the full vocalic inventory, and vowels in this syllable never undergo neutralization, while vowels in unstressed syllables occasionally do. Given our tonal model of Belarusian stress, the phenomenon of pretonic lengthening in this dialect can be analyzed as resulting from tone spreading conditioned by the quality (and, correspondingly, the intrinsic duration) of the stressed vowel. We go on to consider how the tonal model can be used to account for the properties of the immediately pretonic syllable in various types of neutralizing dialects of Russian analyzed in Bethin (2006).

In the next two chapters, we explore some further applications of the tonal model. **Chapter 4** presents a tonal reanalysis of the accentuation of athematic nouns in Proto-Indo-European. The tonal analysis of Indo-European is performed against the background of metrical/accentual analyses in Kim (2002) and Frazier (2006). Again, an analysis based on tone proves to be much simpler than the metrical analyses. The main problem with Kim's account is that he is forced to posit morpheme fusion, including the fusion of derivational suffixes with inflectional endings into a single morpheme. As Frazier *(op. cit.)* correctly points out, the same endings are easily recoverable from elsewhere in the language, so the reasons why learners would treat their combinations with certain suffixes as single units are unclear. Frazier's analysis, performed in the framework of Optimality Theory, does not resort to morpheme fusion. However, her analysis is exceedingly complicated with respect to input representations and processing. Apart from unmarked and accented morphemes, there are morphemes variously marked as post-accenting, pre-accenting, and dominant. Post-accenting and pre-accenting morphemes trigger alignment constraints subcategorized for the two groups. Dominant morphemes trigger constraints formulated in terms of Anti-Faithfulness for Optimal Paradigms. Under the Optimal Paradigms model presented in McCarthy (2005), the grammar evaluates candidates consisting of entire paradigms. The output of each member of a paradigm is in correspondence not only with its input but also with the outputs of every other member of the paradigm. While OP faithfulness constraints promote uniformity within a paradigm, OP Anti-Faithfulness constraints, triggered by dominant inflectional endings, require that the shared stems of paradigm members differ in some respect (in the case at hand, in respect of the location of stress). OP constraints are bidirectional (each member of a paradigm is compared with every other member), OP Anti-Faithfulness constraints are unidirectional (forms with dominant inflectional suffixes are compared with forms with recessive inflectional suffixes). In addition to OP and ¬ OP[3], a faithfulness constraint like MAX(ACCENT) is subcategorized for roots and derivational suffixes: $\text{MAX(A)}_{\text{ROOT}}$, $\text{MAX(A)}_{\text{DERIV}}$. As a result, an output form is assessed for the satisfaction of MAX(A), $\text{MAX(A)}_{\text{ROOT}}$, $\text{MAX(A)}_{\text{DERIV}}$, OP-MAX(A), and ¬ OP-MAX(A). The same holds true for other faithfulness constraints.

The tonal analysis we present in chapter on Indo-European does not require any extensions of Optimality Theory. The faithfulness constraint MAX(TONE) is used only in its standard variant. We employ standard tonal representations, which are less complex than

[3] The negation symbol (¬) is used to notate Anti-Faithfulness.

the accentual representations in Frazier (2006) thanks to the lack of the dominant/recessive dichotomy and of the diacritical marking of post- and pre-accentuation. At the end of the chapter, we examine limitations on the process of internal derivation in Indo-European. This derivational mechanism consisted in the change of the accentual class of a word without any changes in its morphemic composition. Interestingly, the direction of such a change was not arbitrary. Since there are four accentual patterns of athematic nouns, one could expect twelve directions of internal derivation. However, only five are attested. Tonal representations provide an elegant way of accounting for the limitations on internal derivation. Given the representations we proposed when analyzing the accentual patterns, internal derivation can only consist in the delinking, deletion or rightward shifting of tone present in the original input. No new structure can be added in the course of internal derivation: tone cannot be inserted and new association lines can only be created as part of tone shifting.

In **Chapter 5**, we present a rather unexpected application of the tonal model to length alternations in Slovak and, in particular, to the celebrated Rhythmic Law. The Slovak Rhythmic Law consists in the shortening of syllable nuclei whenever the preceding nucleus is long. A long nucleus is defined as a long monophthong, a diphthong or a long syllabic liquid. The process mostly applies to inflections, although some derivational suffixes also undergo shortening under the Rhythmic Law.

The Rhythmic Law has been analyzed as a cyclic rule of progressive shortening (Kenstowicz & Rubach, 1987; Rubach, 1993) and as a metrical process (Bethin, 1998; Mellander, 2003). According to Mellander's analysis of Central Slovak dialects, in a sequence of two long nuclei HH, the second nucleus is shortened as part of the construction of the preferred uneven trochaic foot. The preference is expressed through the constraint HEADPROM, which requires the head of a foot to be more prominent than its tail. This solution entails a number of theoretical problems. First, the very existence of uneven trochees is questioned by metrical theory (Hayes, 1995). Second, the stress system of Standard Slovak is described as based on quantity-insensitive syllabic trochee (Dogil *et al*., 1999), which means the need for the construction of two distinct foot types. Finally, it is unclear whether Mellander's account is compatible with the fact that Slovak diphthongs are short phonetically (Bethin, 1998). In a trisyllabic word of the form (L)(HL), where H is formed by a diphthong, the head of the uneven trochee is neither stressed nor long; in other words, it is no more prominent phonetically than the tail of the hypothetical foot. In order to reconcile the metrical account of the Slovak Rhythmic Law

based on uneven trochee with the Iambic/Trochaic Law formulated in Hayes (1995), Bethin (1998) proposes that 'the Rhythmic Law is not quantity-based as much as it is intensity-based, though the intensity is realized by syllable length.' Indeed, Slovak length does have certain accent-like properties. One of such properties is that a single morpheme can never contain more than one long nucleus in the input. In this respect, Slovak length reminds high tone in some Bantu systems and underlying accent in East Slavic. Thanks to the Rhythmic Law and other length alternations, this property of Slovak length is often tantamount to culminativity on word level.

Another problem with a strictly metrical account of the Rhythmic Law is the considerable number of morpheme-specific exceptions. In fact, Ďurovič (2006) suggests that the 'automatic' application of the Rhythmic Law is limited to inflectional endings; a similar, although not quite categorical, view is expressed by Kačala (2003). In fact, currently there seems to be a consensus among Slovak linguists as to the morphological conditioning of the Rhythmic Law. Clearly, this is not a typical property of a metrical process.

One of the morphemes resistant to progressive shortening under the Rhythmic Law is the agentive suffix *-ár*. Besides being resistant to shortening, the suffix may trigger regressive as well as progressive shortening of the neighbouring long nuclei. In this respect, the suffix reminds dominant accented suffixes of East Slavic: just as a dominant suffix is stressed irrespective of the underlying accentual properties of all the other morphemes of a given word, the suffix *-ár* realizes its underlying length irrespective of the neighbouring morphemes. Some derivational suffixes with underlyingly long nuclei do undergo progressive shortening under the Rhythmic Law; on the other hand, when their underlying length is realized in the output, they trigger the shortening of the inflectional endings. This behaviour is reminiscent of the recessive accented suffixes of East Slavic, whose underlying accents prevail over the accents of inflections but not over the accents of roots. We develop this analogy and Bethin's (1998) insight that length in Slovak seems to be an 'expression of something else' [than length – A.D.] by proposing that all the instances of nuclear length involved in length alternations (either triggering or undergoing alternations, or both) are encoded with a tonal feature. Nuclei that neither trigger nor undergo length alternations are either 'genuinely' long or else come from synchronic coalescence.

The tonal feature introduced above can be either associated or floating in the input. Disassociation of the feature is not allowed, while the creation of new association lines is only possible if the resulting output will not contain a sequence of adjacent instances of

the feature in violation of the Obligatory Contour Principle. Now the Rhythmic Law can be seen as an *alter ego* of the celebrated Meeussen's Rule known from Bantu. If the ban on the delinking of association lines outranks the OCP, then suffixes with a pre-linked instance of the tone-like prominence feature will be resistant to shortening while being able to trigger it. The OCP-based approach constitutes an elegant expression of the 'conspiracy' of progressive and regressive shortening processes in Slovak aimed at the avoidance of adjacent long nuclei. At the same time, being based on an autosegmental feature that can be either associated or floating in the input, the approach is flexible enough to account for the fact that length alternations do not apply across the board and are dependent on the properties of particular morphemes.

In the concluding **Chapter 6**, we consider the implications of the tonal model of free stress for the classification and typology of word prominence. We point out that free-stress systems show non-trivial similarities with pitch-accent systems like Japanese or Serbo-Croatian: the locus of word prominence is not predictable and depends on the underlying accentual properties of component morphemes; affixes may be recessive or dominant; the anticipatory spreading of high tone in Japanese and, especially, in Serbo-Croatian is reminiscent of the realization of Belarusian and Russian prominence over two syllables. Moreover, as Halle (1997, p. 286) remarks, 'the Serbo-Croatian accentual system is essentially identical with that of Russian. In particular, the underlying representations of many Serbo-Croatian words are identical with those of their cognates in Russian.' If this is indeed so, then, no matter how one analyzes the respective accentual systems, the resulting analysis must be applicable to both of them. This is where the following theoretical problem arises.

There is apparently a consensus within the theory of tone to the extent that pitch-accent languages lend themselves to tonal analysis and constitute a subgroup of restricted tone languages (cf. Gussenhoven, 2004; Hyman, 2006; Yip, 2002). At the same time, Hyman (2006) explicitly states that an analysis in tonal terms is available for pitch-accent languages but not for any stress languages. Given this dictum, the 'essentially identical' accentual systems of Serbo-Croatian and Russian do not lend themselves to identical analyses. Now the transition from the pitch-accent systems of Early East Slavic to the modern free-stress dialects must be seen as a replacement of tonal representations and processing mechanism with metrical ones. It is remarkable that such a massive restructuring of the lexicon and the grammar did not lead to any catastrophic shifts in the loci of prominence: the very fact that there is a good synchronic correspondence between the loci of prominence in the geographically and historically separated East Slavic and

Serbo-Croatian dialects indicates the conservative nature of the dialects with respect to the original Late Common Slavic accentuation.

While tonology abnegates its power to apply the same analytical tools to pitch-accent and free-stress languages, models employing underlying accents have demonstrated their capacity to handle both types of prominence. Thus, Halle (1997) applies the same accentual analysis to Russian and Serbo-Croatian. In his turn, van der Hulst (2011) suggests that pitch-accent systems as well as *all* restricted tone languages can be analyzed in terms of accent, provided that accents are allowed not to be culminative and obligatory. In the present thesis, we restore the balance between the purely tonal and the accentual approaches by developing a tonal model of free stress. The model provides a natural way to capture the affinity between free stress and restricted tone (including lexical pitch-accent).

We argue that the traditional, phonetically grounded differentiation between stress and pitch-accent systems is uninformative from the learner's point of view. It creates a false impression that there is an essential similarity between fixed-stress and free-stress systems. At a closer look, it turns out that the only noteworthy property shared by a free-stress system like Belarusian and a system with surface-predictable stress like Polish is that prominence in these languages is expressed by means other than pitch movement – which is hardly revealing. A classification which is much more relevant for language learners and researchers can be achieved by considering how the locus of word prominence – whatever its phonetic expression – is established. The primary differentiation is now between metrically determined, predictable prominence (prototypically, stress) and lexically encoded, unpredictable prominence (prototypically, tone).

The tonal model of free stress developed in the present work predicts that free stress is incompatible with unpredictable tone[4] – we refer to this prediction as 'the Incompatibility of Freedoms Hypothesis.' By extrapolating this hypothesis to all systems with contrastive stress, one arrives at the hypothesis that contrastive stress is incompatible with contrastive tone. The extrapolation presupposes that all systems with contrastive stress require tonal representations and processing. We show that this hypothesis might be too strong. According to Remijsen (2001), stress and tone in Papiamentu are independently contrastive. However, high tone in Papiamentu is largely a morphosyntactic marker (Kouwenberg, 2004), and as such it can be regarded as a separate morpheme

[4] That is to say, tone whose presence and/or location is unpredictable.

rather than as part of the input representation of other morphemes (for a discussion of the phenomenon of featural affixation see Akinlabi, 1996). High tone in Papiamentu is contrastive but mostly predictable. Another example of a system with independently contrastive stress and tone cited by Remijsen is Ma'ya. Under his analysis, neither tone no stress is surface-predictable in the language. Still, the Incompatibility of Freedoms Hypothesis is not necessarily falsified, as stress in Ma'ya is limited to the final and penultimate positions. The purported contrastiveness of stress in this language can therefore be encoded in standard metrical terms by the use of extrametricality/catalexis. Correspondingly, tonal representations can be reserved for the encoding of tonal melodies.

In the present work, we apply tonal analysis to a whole range of seemingly disparate phenomena: stress (Belarusian and other East Slavic languages), pitch-accent (Late Proto-Indo-European), and length (Slovak). Given the fact that stress in Belarusian is cued by duration, the phonetic exponent of phonological tone in both Slovak and Belarusian is duration. We provide a brief review of the articulatory and perceptual correlations between tone and duration and of diachronic evidence of tone having been reanalyzed as duration, and *vice versa*. In diachronic terms, East Slavic stress, which is realized as vowel duration, is a reflex of culminative tone. The surprising stability of East Slavic loci of prominence, despite the loss of lexical pitch in most dialects, is one of the reasons behind our proposal that the representation and processing of prominence in modern East Slavic is still tonal.

While we do not discuss the status of tone in phonology at any length, it is clear that our analysis involves the assumption that tone is a more abstract feature than usually believed and does not have a unique phonetic correspondent. In this respect, our analysis follows Lockwood's (1983) insight on the non-unique nature of the phonetic interpretation of phonological tone. The important difference is that Lockwood explicitly requires phonological tone not to be culminative, whereas our analyses of Belarusian and Indo-European operate with culminative tone. In connection with the issue of the phonetic realization of phonological tone, we briefly comment on the possibility of a tonal analysis of consonant laryngealization in Cuzco Quechua. Hyman (2006) rejects the idea that the accent-like properties of laryngealization in this language call for an analysis in terms of a 'glottal accent' on the grounds that the language already has a 'stress accent' (fixed penultimate stress). We point out that there is a close relationship between laryngeal features and tone, and suggest that Cuzco Quechua can lend itself to a tonal analysis. The fact that the language has a metrically assigned stress is of no import, since

there are numerous examples confirming that phonological tone and metrically assigned stress are not incompatible.

In conclusion, we adduce Dybo's (1989) desideratum for a unified prosodic theory of tone and stress. This thesis can be seen as a step towards the development of such a theory.

1. Previous work on East Slavic stress

1.1 Introductory remarks

In this chapter, we review a number of relatively recent works dedicated to the analysis of Russian stress. The first two works to be reviewed (Halle, 1997; Melvold, 1990) contain rule-based analyses. The remaining works (Alderete, 1999; Crosswhite *et al*., 2003; Gouskova, 2010; Revithiadou, 1999) are written within the Optimality Theory (OT) framework. As our own analysis is tailored to be expressible in OT terms and mostly covers the accentuation of non-derived nouns, we limit our discussion of the extensive account of Russian stress worked out in Melvold (1990) to absolute essentials, omitting theory-internal formalism whenever possible. The sections devoted to the review of OT-based works examine the formal aspects of the analyses in more details. Throughout the discussion, we assume that the reader is familiar with OT in general and with the correspondence theory in particular. Considering the fact that many OT concepts, such as positional faithfulness and positional markedness, have received ample attention in the literature, we treat them as not requiring explanation.

1.2 The analysis in Melvold (1990)

1.2.1 Accentuation of non-derived nouns

One of the most comprehensive studies on Russian stress is developed in Melvold (1990). Written in the framework of cyclic phonology, this work remains an important contribution to the analysis of the accentuation of both non-derived and derived words in Russian. Our review of the solutions proposed by Melvold will be focused on the analysis of stress patterns exhibited by non-derived nouns, which corresponds to the scope of our own work on stress in Belarusian. Stress in derived nouns will be given a cursory review only, while adjectival and verbal stress will remain outside the scope of this brief presentation, unless required to make a specific point.

Russian non-derived nouns exhibit the following major accentual patterns:

a) Pattern A – stress is fixed on one and the same position in the root throughout the singular and plural declensional paradigms;
b) Pattern B – stress is fixed on the inflection; if no overt inflection is present, it is assigned to the last syllable of the root;
c) Pattern C – stress alternates between the first syllable of the root and inflections;
d) Pattern D – stress alternates between the inflection in the singular and the last syllable of the root in the plural.[5]

The analysis is based on the assumption that every morpheme is stored in the lexicon as either accented or unaccented. Melvold defines accent as 'a diacritic feature denoting metrical prominence' (*op. cit*. p. 16). This diacritic feature 'is associated with a particular vowel in the underlying representation of a morpheme' (*ibidem*).

Russian stress is seen as governed by the Basic Accentuation Principle originally proposed for Indo-European in Kiparsky and Halle (1977):

(1) Basic Accentuation Principle (BAP)

Assign stress to the leftmost accented vowel; if there is no accented vowel, assign stress to the initial vowel.

Let us see what consequences the BAP has for the accentual patterns of non-derived nouns, given the above assumption about the underlying accentual properties of morphemes. If the root of a non-derived noun has an accented vowel, it is this vowel that will be stressed irrespective of the accentual properties of the case ending, since the root accent is the leftmost one. If the root is unaccented, the accentual properties of the case ending will determine the location of stress. A form that contains no accented morpheme will be stressed on the first syllable of the word by default; a form with an accented case ending will have stress on the ending. Now the accentual patterns A and C can be accounted for: the roots of pattern A nouns are underlyingly accented, while the roots of pattern C nouns are underlyingly unaccented.

[5] The label used by Melvold is B'. We use the letter D for the sake of consistency with the ensuing chapters.

Because some inflectional endings are accented and others unaccented, the existence of the accentual pattern B, in which stress is fixed on the desinence, comes unexpected. The pattern could theoretically be produced as a result of accented endings being attached to unaccented roots. However, none of the existing declension paradigms involves accented endings only, as evidenced by the existence of C-pattern nouns which take the same declensional endings as B-pattern nouns, cf. *kalan'ča* 'fire tower' Nom. Sg, *kalan'ču* Acc. Sg **but** *golo'va* 'head' Nom. Sg, *'golovu* Acc. Sg. The fact that the nominative singular form *golo'va* is stressed on the ending means that the ending *-a* is accented, and the root *golov-* is unaccented. The word-initial stress of the accusative singular form *'golovu* proves that the ending *-u* is unaccented. Melvold proposes that the roots of pattern B nouns constitute a subset of accented morphemes. If polysyllabic, these roots are accented on the last vowel. In addition, they are specified as triggering the rule of Post-Accentuation, which shifts stress one position to the right from the underlyingly accented vowel. Post-accentuation is stipulated to apply only when the accented syllable is penultimate in the respective word. The stipulation is necessary to explain the fact that, in derived nouns, post-accenting roots apparently do not transfer stress to unaccented derivational suffixes. However, this formulation of the environment of the rule of Post-Accentuation is problematic in the case of the disyllabic instrumental plural ending *-ami*. When this ending is attached to a post-accenting root, the accented vowel of the root is antepenultimate in the respective word form, so the environment of the rule is not met and root stress is expected. In fact, instrumental plural forms of post-accenting nouns are stressed on the first vowel of the ending: *kalan'čami*. One way to save the analysis is to posit that the second syllable of the ending is extrametrical.[6] Alternatively, one could make reference to the stem boundary but, as Melvold proves in a different part of her work, the rule of post-accentuation is post-cyclic, which makes reference to morpheme boundaries problematic.

The roots of pattern D nouns are also analyzed as post-accenting, which explains the fixed inflectional stress in the singular. In the plural, these roots trigger the rule of Retraction, and stress is shifted from the ending to the last syllable of the root. The Retraction rule is also used to account for about two dozen nouns whose roots behave as

[6] As far as we could establish, Melvold does not invoke extrametricality in the context of this ending. We shall see how extrametricality is used to explain some unexpected cases of post-accentuation when discussing derivational suffixes.

unaccented (pattern C) in the singular, but in the plural are consistently stressed on the last syllable of the root.

Let us briefly recapitulate the analysis of the four accentual patterns. The roots of pattern A nouns are accented. The roots of pattern C nouns are unaccented, so the location of stress in any given case/number form depends on whether the respective ending is accented or not. The roots of pattern B nouns are post-accenting. That is to say, they are accented on the last vowel and marked as triggering the rule of Post-Accentuation. The roots of pattern D (B') nouns are accented, post-accenting and marked as triggering the rule of Retraction in the plural.

Underlying accentual contrasts are supported not only by overt inflectional endings but also by 'zero' endings. The root of *golo'v-a* 'head' is underlyingly unaccented. When an unaccented ending is attached, stress is assigned to the leftmost syllable by default: *'golov-u* Acc. Sg; when an accented ending is attached, stress is assigned to the ending: *golo'v-ami* Inst. Pl. Unexpectedly, the genitive plural form *go'lov*, which has no overt ending, is stressed on the last syllable of the root rather than by the word-initial default. The analysis is that, underlyingly, the genitive plural ending is an accented abstract vowel, a yer. Yer (also known as jer) vowels constitute a characteristic phenomenon of Slavic (Lightner, 1972). A yer vowel surfaces only when followed by another yer; when followed by a regular vowel, such vowels are not vocalized (fail to surface).[7] A word-final yer therefore never gets a chance to surface, and its presence can only be established through the vocalization of the preceding yer. All the nominal 'zero endings' are traditionally analyzed as involving an underlying yer, because they trigger yer vocalization. Being underlyingly accented, the yer vowel of the genitive plural ending is assigned stress by the BAP. When the vowel fails to surface, stress is shifted to the preceding syllable. The reason for this shift will become clear from the metrical grid formalism of the Basic Accentuation Principle.

1.2.2 The formalism of the Basic Accentuation Principle

The formal representation of stress in Melvold (1990) assumes that stress is represented on a separate autosegmental plane, in agreement with the proposal of Halle and Verg-

[7] This is just one of possible analyses. We recount it, because it is consistent with how yers are treated in Melvold.

naud (1987). The plane contains a metrical grid consisting of several lines. The bottom grid line, Line 0, is formed by the projections of all stressable elements of a given word, represented as a sequence of asterisks. An underlying accent is represented as a Line 1 asterisk on the grid.

Sequences forming the grid are organized into headed metrical constituents. The heads of constituents formed on Line 0 are projected on Line 1. Elements of Line 2 represent the heads of the constituents formed on Line 1. According to Melvold, Line 0 metrical constituents in Russian are unbounded and right-headed.[8] Line 1 constituents are also unbounded but left-headed. The metrical rules for Russian are as follows:

(2) Metrical rules for Russian (Melvold, 1990, p. 41)

i. Assign a Line 1 asterisk to all accented vowels; if there is no accented vowel, assign a Line 1 asterisk to the initial vowel.
ii. Construct constituent boundaries on Line 0.
iii. Construct constituent boundaries on Line 1 and locate the head of Line 1 on Line 2.
iv. Conflate Lines 1 and 2.

The term 'Basic Accentuation Principle' is used to refer to the set of metrical rules above. The foot construction rule in 2.ii is subject to the Exhaustivity Condition on theory-internal grounds, as Russian provides no empirical evidence for iterative foot construction.

The BAP rule is cyclic and subject to Strict Cyclicity Condition,[9] wherefore it does not apply on Cycle 1. If the rule applied on Cycle 1, before the concatenation of an inflectional ending, then, in non-derived nouns with unaccented roots, stress would always be assigned to the root-initial syllable. However, in the mobile pattern C, stress alternates between the first syllable of the root and the ending. Forms with inflectional stress prove that the BAP does not apply before concatenation (that is, on Cycle 1).

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[8] The fact that feet are right-headed accounts for the unexpected behaviour of stress in forms like *go'lov*. Recall that the analysis is that, underlyingly, the inflectional ending is an accented *yer*. In the process of derivation, the *yer* vowel is assigned stress by the BAP. Being word final, the vowel does not get a chance to vocalise, and is erased. However, the foot of which it was the head is retained, and the rightmost member of the foot – the immediately preceding root syllable – becomes the new foot head.

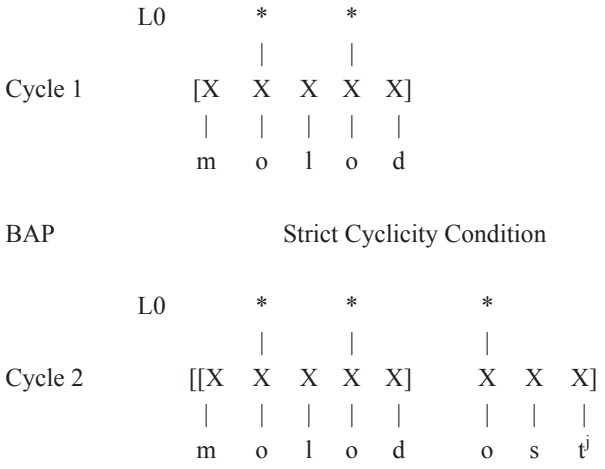
[9] See the original work for the pertinent discussion.

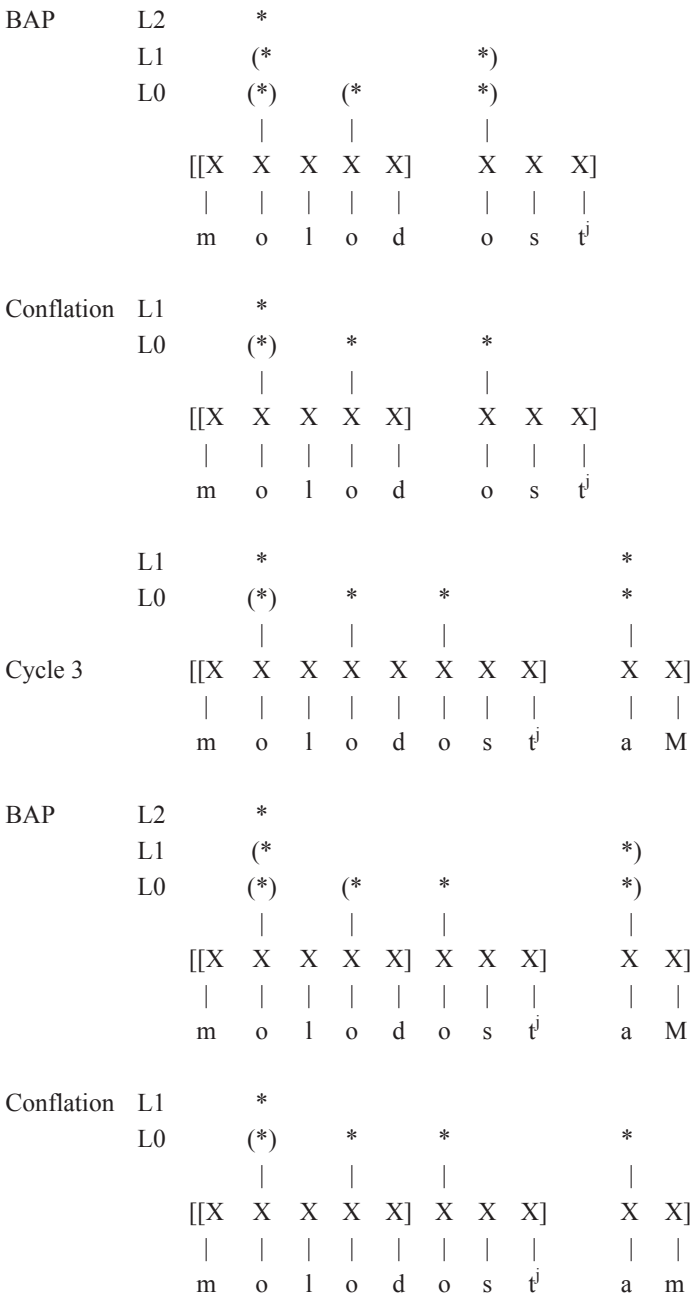
1.2.3 Accentuation of derived nouns

Unlike non-derived nouns, stress in derived words is always fixed either on the stem (the root or a derivational suffix) or, in a much smaller group of words, on the ending. What this means is that the accentual properties of inflectional endings have no bearing on accentuation. This can be accounted for, if one assumes that the stress rule in Russian applies cyclically and that all suffixes are cyclic. In the case of a word form that consists of a root, a derivational suffix, and an inflectional ending, the BAP rule will apply twice: on Cycle 2, after the attachment of the derivational suffix, and on Cycle 3, on which the stem adds an ending. Whatever the accentual properties of the ending, its accent cannot win over the accent assigned by the stress rule on Cycle 2 for the simple reason that any accent assigned on Cycle 2 is necessarily located to the left of an ending, and therefore will be chosen by the BAP.

The above point is illustrated by the derivation of the dative plural form of the de-adjectival noun *'molodost*^{j} 'youth'. The stem is composed of an unaccented root and an unaccented suffix. In the nominative singular, there is no overt ending, and stress is assigned to the leftmost syllable, as expected under the BAP. In the dative plural form *'molodost*^{j}*am*, the underlyingly accented ending *-am* is attached. However, stress is not assigned to the ending, as would be the case in a non-derived noun built on an unaccented root. Below we reproduce the derivation of this genitive plural form.

Figure 1-1: Stress assignment in *'molodost*^{j}*am* (after Melvold, 1990, p. 56)




BAP
L2 * *
L1 (* *) (* *)
L0 (*) (*) (*) *) *) *)
[[X X X X X] X X X]
m o l o d o s t^j
Conflation
L1 * *
L0 (*) * * * *
[[X X X X X] X X X]
m o l o d o s t^j
L1 * * *
L0 (*) * * * * *
Cycle 3 [[X X X X X X X X] X X]
m o l o d o s t^j a M
BAP
L2 * *
L1 (* *)
L0 (*) (* * *) *)
[[X X X X X] X X X] X X]
m o l o d o s t^j a M
Conflation
L1 * *
L0 (*) * * * *
[[X X X X X] X X X] X X]
m o l o d o s t^j a m

After the application of Conflation on Cycle 2, the constituents on Line 0 are eliminated, except for the constituent whose head had been projected on Line 2 – that is, the leftmost one. On Cycle 3, the head of the constituent and the underlyingly accented vowel of the inflection are assigned Line 1 asterisks. Because Line 1 constituents are left-headed, the word stress is assigned to the leftmost vowel – the same as on Cycle 2. As the above derivation illustrates, inflectional endings cannot influence the location of stress in a derived word due to the cyclic operation of the BAP and to the purported cyclic status of all Russian suffixes. As a consequence, stress in all derived nouns is fixed on the stem or, if the stem is post-accenting, on the ending.

The above derivation involved an accented suffix attached to an unaccented root. What happens when the same suffix is added to an accented derivational base (root or stem)? As predicted by the BAP, stress is assigned to the accented vowel of the base, e.g. *gor'bat*[10] 'hunchbacked' → *gor'batost*^{j} 'condition of being hunchbacked.' As far as post-accenting roots are concerned, examples adduced by Melvold demonstrate that they do not transfer stress to unaccented suffixes, so stress is assigned to the underlyingly accented last vowel of the respective post-accenting root. This is in agreement with her formulation of post-accentuation as a rule that only applies if the accented final vowel of a post-accenting root is penultimate in a given word.[11]

Just like roots, derivational suffixes may be either underlyingly accented or unaccented. When an accented suffix is attached to an unaccented base, the derived word will be stressed on the suffix. If the derivational base is accented, the BAP ensures that the base accent wins over the suffixal accent, so the derived word is stressed on the accented vowel of the base, and the suffixal accent is left unexpressed.

Given Melvold's formulation of the rule of post-accentuation (see also Footnote 11), one expects this rule not to apply stem-internally, and indeed this claim is explicitly made in her analysis. As a consequence, there should be no difference in the accentuation of derived words built on a post-accenting base as opposed to an accented base. However, Melvold reports that two adjectivizing accented suffixes, *-liv* and *-ist*, regu-

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[10] The adjective is derived: *gorb-at*, so here the base is a suffixed stem rather than a bare root.

[11] In an alternative formulation, Melvold states that post-accentuation applies before an inflection (*op. cit.*, p. 197). As we have pointed out earlier, the two formulations are not interchangeable due to the existence of the disyllabic instrumental plural ending *-ami*. Also, as we shall see presently, post-accentuation may in fact apply stem-internally.

larly receive stress when following a post-accenting root, *cf*. *to'sk-a* 'melancholy' n, and *to'sk-lʲiv-a* 'melancholy' adj. fem. Sg. The expected locus of prominence in the derived adjective is on the root, and not on the accented post-radical suffix. Indeed, since the last root vowel is not penultimate, the rule of post-accentuation cannot apply, and the BAP should assign stress to the leftmost accented vowel, which is the root vowel. However, it is the suffix that is stressed when following a post-accenting root. Crucially, when following an accented root, the suffix does not attract stress, and stress remains on the root: *ta'lant-a* 'talent' Gen Sg; *ta'lant-liv-a* 'talented' fem. The Basic Accentuation Principle always chooses root accent over suffixal accent, which means that the suffixal stress in *to'skliva* cannot be ascribed to the fact that the suffix is underlyingly accented.[12] What happens therefore is that, in the case of these adjectivizing suffixes, post-accenting roots realize their underlying accents on the suffixes, contrary to the earlier statement that post-accentuation does not apply stem-internally. Melvold accounts for this fact by positing that, in adjectives whose stems are formed with the suffixes in question, **the last syllable of the word** is extrametrical. This solution works in the case of 'short' forms of adjectives, as all the endings they can add are monosyllabic.[13] However, the same stems can form 'long' adjectives, whose inflections can be either monosyllabic or disyllabic: *to'sklʲiv-yj* 'melancholy' adj. masc. Nom. Sg; *to'sklʲiv-uju* 'melancholy' adj. fem. Acc. Sg. If only the last syllable is extrametrical, as stipulated by Melvold, then the respective long adjectives with disyllabic endings should be stressed on the root, and this is not the case. Moreover, it follows from our own observations that at least some of the adjectives derived with the suffix *-liv* can form diminutives: *to'sk-lʲivʲ-enʲk-aja* 'melancholy' adj. dim. fem. Nom. Sg. In the diminutive form, stress is again on the suffix *-liv*, which means that a larger part of the word must be analyses as extrametrical. Therefore, Melvold's analysis must be modified in such a way that the adjectivizing suffixes in question impose extrametricality on **all** the syllables to their right, and not just the last syllable of the respective word. Unfortunately, Melvold does not expand on the formalism of the analysis involving extrametricality; it is not clear whether the idiosyncratic imposition of extrametricality on the final syllable that she posits is performed through

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[12] That the adjectivizing suffixes *-liv* and *-ist* are underlyingly accented is shown by the accentuation of the respective derived adjectives formed on unaccented bases: *vol'n-a* 'wave' Nom. Sg, *'voln-y* Nom. Pl., *vol'nʲ-ist-yj* 'wavy.' The base noun is stressed according to pattern C, so the root is unaccented. The derived adjective is stressed on the derivational suffix, so the suffix is underlyingly accented.

[13] The ending of short masculine adjectives is a *yer*, which never gets an overt phonetic expression due to its word-final position. The *yer* ending must be counted as syllabic until the application of the rule of post-accentuation.

the application of a rule or by some other means. As we have just demonstrated, the stipulation that only the last syllable of a word is extrametrical in the respective derived adjectives is insufficient.

1.2.4 Dominant and recessive suffixes

We saw in the preceding subsection that derived suffixes cannot be stressed, if attached to an underlyingly accented root, due to the cyclic application of the BAP. However, some Russian suffixes are stressed irrespective of the accentual properties of the root/stem to which they are attached: *ra'bot-a* 'work' (pattern A) → *rabo't^{j}-ag-a* 'hard worker.' In the example, although the derivational suffix is attached to an accented root, stress in the derived noun is assigned to the suffix, and not the root, as expected. Such suffixes are analyzed as deleting any accents on the base to which they are attached. In the literature, these suffixes are referred to as **dominant**. This is how Melvold describes the respective formalism: 'dominant suffixes are affixed on a plane distinct from the stem, while nondominant suffixes are not. Affixation of a dominant suffix is accompanied by copying the content of the stem except for metrical information' (p. 63). Suffixes that are not dominant are referred to as recessive. Dominant suffixes are marked in the underlying representation with the appropriate diacritic mark – Melvold uses the subscript ($_{d}$); recessive suffixes are unmarked. Most of the dominant suffixes in Russian are post-accenting, some are accented, and one is unaccented. In derived words formed with a dominant accented suffix, stress is assigned to the suffix itself. In words with a dominant post-accenting suffix, stress is inflectional. The only unaccented dominant suffix -*En^{j}*[14] causes stress to be assigned to the first syllable of the derived word, irrespective of the accentual properties of the root.

Dominance is an idiosyncratic property of suffixes. Both derivational and inflectional suffixes can be dominant. In addition, Melvold posits the existence of dominant/recessive allomorphy for one inflectional ending (*op. cit.*, Endnote 31 on p. 105). The feminine noun *'ploščad^{j}* 'area, square' is stressed on the root in all the declension cases of both numbers, which means that the root is accented. However, the genitive plural form *plošča'd^{j}-ej* is unexpectedly stressed on the ending. The stem of the noun *t^{j}e'trad^{j}* 'exercise book' is also accented, and there is no stress shift to the genitive plural

[14] The capital E stands for a front yer vowel.

ending: *tʲe'tradʲej*, not **tʲetra'dʲej*. The analysis is that the first noun adds the dominant allomorph of the ending, while the latter adds the recessive allomorph.

Allomorphy is also used to account for the unexpected behaviour of some masculine nouns with pattern-A roots. In the singular, these nouns are realized with a fixed stress on the stem, but in the plural, stress shifts to the inflections: *pro'fessor* Nom. Sg. but *professo'ra* Nom. Pl.[15] Melvold's analysis is that the respective roots have two allomorphs: one accented (used in the singular) and the other unaccented (used in the plural). An alternative analysis would be that the plural endings have a dominant series chosen by this group of nouns.

The most fundamental element of the analysis of Russian accentuation developed in Melvold is the Basic Accentuation Principle. In the following section, we briefly review evidence that challenges its synchronic status in Russian.

1.3 On the synchronic status of the Basic Accentuation Principle

1.3.1 Stress default in Russian

Under the Basic Accentuation Principle (BAP), a word consisting of unaccented morphemes is assigned word-initial stress, while a word with more than one underlying accent is stressed at the location of the leftmost one of them. One naturally expects that this leftward preference will be manifested as stress default e.g. in the prevalent accentuation of borrowings or nonce words. As a matter of fact, all the relevant studies seem to indicate that the preferred location of stress is at the right edge.

Mayer (1976) studies the accentuation of about a thousand foreign place names in Russian. He focuses on the variability of stress norms in this class of borrowing, namely, on the tendency of prescriptive norms to shift from internally motivated ('traditional') stress towards stress whose location corresponds to that in the source language (e. g. *Bo'ston* → *'Boston*, *Ju'kon* → *'Jukon*, *A'jova* → *'Ajova*). What is of interest to us here is Mayer's conclusion as to the location of traditional, or internally motivated, stress.

[15]This accentuation is the prescriptive norm for this word. In some other words, inflectional stress in the plural is characteristic of colloquial speech or professional slang.

According to him, it is 'to be defined as occurring on the last syllable of the stem.' This tendency is also acknowledged, although not quite so unequivocally, by Shapiro (1968).

The conclusion reached by Mayer (1976) seems to be compatible with the results of experimental data available. In her report on an experiment devised to study the accentuation of unfamiliar borrowings by native speakers of Russian, Nikolaeva (1971) identifies a number of tendencies concerning the location of stress. One of the main tendencies is to have word-final stress in words which end in a consonant, and penultimate stress in words that have a vowel as their final segment. This preference could in principle be indicative of a metrical system based on moraic trochees with moraic coda consonants. In such a system, stress would be assigned to the penultimate mora. However, as Crosswhite *et al.* (2003) point out, such an account is not supported by other aspects of the phonology of Russian.

D'jačok (2002) reports an experiment in which Russian speakers were asked to read aloud di- and trisyllabic nonce words. The prevailing pattern that emerged from the experiment was the same as in Nikolaeva's study of the accentuation of unfamiliar borrowings, namely: words with word-final consonants were stressed on the final syllable, while words that ended in a vowel were stressed on the penultimate. Unfortunately, the data presented in his article allow only for a limited evaluation of the methodology used to perform the experiment. If the nonce words in question had been constructed in such a way that they resembled native non-derived nominal forms, then word-final vowels could have been construed by the participating subjects as nominal case-endings. Under this assumption, the prevailing stress pattern (word-final stress if the final syllable is closed and penultimate stress if the final syllable is open) can be described in a unified manner as stem-final or root-final.

Crosswhite *et al.* (2003) conducted a similar experiment specifically designed to test for morphological effects on default accentuation. According to them, 'Results show a strong morphological effect: speakers stressed the last syllable of the stem, i.e., the ultima in words without inflections, and the antepenult or penult in words with inflections (depending on length of the inflection)' (*op. cit.*, p. 151). Specifically, disyllabic inflections correspond to antepenultimate stress, while monosyllabic inflections – to penultimate stress. This dependence of the location of stress on the length of the inflection undermines the moraic model mentioned above. Note also that some monosyllabic endings end in a sonorant (*-am*, *-ej*, *-oj*). If coda consonants are moraic, as required by

the moraic analysis mentioned above, then nonce nouns with these endings are expected to be stressed on the ending. As far as we can judge from the results reported in Crosswhite *et al*. (2003), this is not the case.

1.3.2 Word-initial default and the development of Slavic stress systems

Another empirical field where one could expect to see the operation of the BAP in Slavic languages is the development of fixed-stress systems from free-stress systems. Considering the development of word-initial stress in West Slavic as opposed to the free-stress system of Common Slavic, Halle (1997, p. 299) writes, 'We account for the evolution of word-initial stress by positing that in these languages all accentual indications were eliminated from the lexicon.' Under the BAP, the elimination of underlying accentual diacritics directly results in the establishing of word-initial systems (such as e.g. Old Polish, Modern Czech and Slovak), because, in the absence of an accented vowel, stress is assigned to the leftmost syllable of any given word. In the case of Polish, Halle sees the word-initial stage as a natural intermediate period between the free stress of Common Slavic and the fixed penultimate stress of modern Polish. This is an extremely attractive scenario, if only due to its elegance.

In some Slavic languages, the shift from free stress to fixed stress has finished only recently or is still ongoing. In his work on the development of fixed stress in free-stress systems, Baerman (1999) examines a wide range of dialectal variation in [Slavic] Macedonian, Kashubian, and Ukrainian. All these languages have living or well-documented dialects with free stress as well as dialects with fixed stress. Baerman makes the following observation concerning the Basic Accentuation Principle: 'Under BAP, which is assumed to have applied in Common Slavic, the phonology assigned default stress to the initial syllable of the word. However, in none of the languages examined here does initial position function as the phonological default, except where fixed initial stress prevails. Only in Kashubian can initial position be seen as playing a role in the intermediate stages of the evolution of fixed stress; even here, it is only manifested in verbs' (*op. cit*., p. 132).

As the reader will see from our brief analysis of stress variation in Modern Belarusian, some cases of stress shifts can be analyzed as following from the elimination of underlying accentual properties of the respective roots. However, there are concurrent cases of stress variation that can be analyzed as resulting from the creation or change of

accentual properties. In view of this bidirectional nature of stress variation in a modern free-stress system, an across-board elimination of all the underlying accentual properties of all the morphemes within a relatively limited time span between the split of Common Slavic and the rise of word-initial stress in West Slavic appears as quite an extraordinary development.

1.4 Accentuation of non-derived Russian words in Halle (1997)

The account of Russian stress presented in Halle (1997) is based on the metrical theory developed by Idsardi (1992). Under this theory, stress 'is computed on a separate autosegmental plane' (Halle, *op. cit.*, p. 276). Every phoneme which is potentially stress-bearing is projected on this plane. In the notation adopted in this framework, the projections are designated by asterisks, and a sequence of asterisks is referred to as a *line*. The line consisting of initial projections is labelled line 0. Considering the fact that only vowels can bear stress in Russian, line 0 consists of projections of vowel phonemes,[16] as below:

Figure 1-2: Construction of line 0 projection of *gorod+u* 'town' Dat. Sg

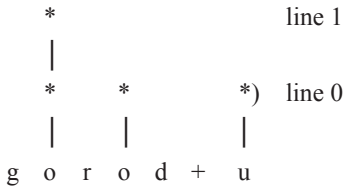
```
    *     *         *   line 0
    |     |         |
g   o   r   o   d   +   u
```

Sequences of asterisks on a given line are grouped into metrical constituents (feet) by parameterized edge-marking rules. For Russian, Halle posits the following edge-marking rule for line 0: place a right parenthesis to the right of the rightmost syllable of the string – abbreviated as RRR. In view of the fact that earlier Halle specifically states that 'feet are composed of the stress-bearing elements in the sequence – that is, those projected on line 0 of the grid-rather than of syllables or of phonemes, as in other theories,' one has to assume that the reference to 'the rightmost syllable' in the formula-

[16] Here we would like to note that, under some well-established derivational theories of glide representation, whether a vocalic underlying element surfaces as a vowel or a glide, is determined by language-specific rules of syllabification. Given that in East Slavic, including Russian, glides are not stress-bearing, underlying forms, which are not syllabified by definition, may contain insufficient information as to the ability of a particular vocalic element to bear stress. Therefore, it may be the case that Halle's analysis must adopt a theory of segmental representation which sees glides as non-derived.

tion of the RRR edge-marking rule cited above is an informal shortcut. Unlike many other metrical theories, the notation adopted by Halle/Idsardi does not require a set of two counter-directed parentheses of the type (s w). Rather, 'a left parenthesis groups all metrical elements on its right up to the next parenthesis or to the end of the string, whereas a right parenthesis groups the elements on its left up to the next parenthesis or beginning of the string. Elements that are not to the right of a left parenthesis or to the left of a right parenthesis are not part of any constituent or foot' (*op. cit.*, p. 277). For Russian, it means that feet are unbounded, and that footing is non-exhaustive. Metrical constituents are headed, and the head is determined on the basis of the respective head-marking rule which specifies either the leftmost (abbreviated as L) or the rightmost (R) element of a constituent as its head. Halle postulates that, in Russian, metrical constituents constructed on line 0 are subject to the head-marking rule L.

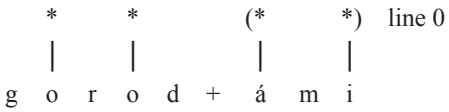
Figure 1-3: Construction of line 1 projection of *gorod+u* 'town' Dat. Sg



All the elements on line 0 are included into a single foot, being to the left of a right parenthesis without any other parentheses intervening until the left edge of the string. The head-marking rule L marks the leftmost element of the metrical constituent as the head. Heads of metrical constituents are projected on the next line. The entire set of lines is said to form a *metrical grid*. In this case, the head of the single foot formed on line 0 is projected on line 1. After the subsequent projection on line 2, the initial stress-bearing element is chosen as the head of the word, and the word surfaces with initial stress.

In terms of the accentual properties of its morphemes, neither the root nor the inflectional ending in the word form analyzed above is accented, to apply the term used in Melvold (1991). Let us consider a word form with the same root but an accented inflection.

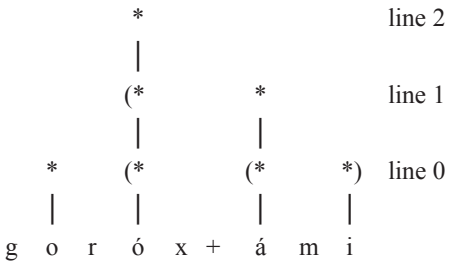
Figure 1-4: Construction of line 0 projection of *gorod+ámi*[17] 'town' Inst. Pl



Halle proposes that 'inherently accented' Russian morphemes are supplied with a left parenthesis. In the case of the instrumental plural ending *-ámi*, a left parenthesis is placed before the first stress-bearing element. The acute symbol used to mark accented vowels does not mean that there is some diacritic mark indicating where a parenthesis should be inserted in the process of the construction of line 0. Halle makes an explicit claim that an accented element 'is one that is supplied with a parenthesis in its lexical representation.'

Now let us consider a word form consisting of an accented root and an accented inflection.

Figure 1-5: Construction of the metrical grid of *gorόx+ámi* 'pea' Instr. Pl

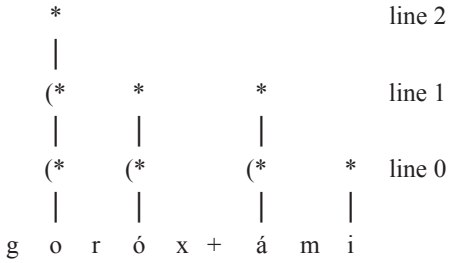


For line 1, Halle posits the LLL edge-marking rule and the L head-marking rule. Line 0 contains two metrical constituents: one consisting of a single element and another one consisting of two elements. Their heads, marked in accordance with the L head-marking rule, are projected on line 1, where they form a new left-headed metrical constituent. Next, the head of the constituent is projected on line 2 and is thus chosen as the head of the word.

[17] Halle employs the acute (´) symbol over a vowel to designate its inherently accented status.

Forms with underlyingly accented morphemes demonstrate why the edge-marking rule on line 0 is RRR rather than LLL. If we go back to the form in Fig. 1-3, which contains two unaccented morphemes, a LLL edge-marking rule in combination with the L head-marking rule would do the job of correctly choosing the initial element as the locus of word stress. However, in cases like those in Fig. 1-4 or Fig. 1-5, LLL edge-marking on line 0 would form an additional metrical constituent, whose head would be next projected on line 1 and incorrectly chosen as the element to be projected on line 2:

Figure 1-6: Hypothetical construction of the metrical grid of *gorόx+ámi* 'pea' Instr. Pl with the LLL edge-marking rule on line 0



In Fig. 1-6, the application of the LLL edge-marking rule results in the construction of a foot at the left edge of the sequence of elements on line 0. When projected on line 1, the head of this foot becomes the leftmost element of the single metrical constituent constructed on that line. Thanks to an application of the L head-marking rule on line 1, the leftmost element of line 0 ultimately becomes the element that is projected from line 1 on line 2. As a result, the word would surface with root-initial stress instead of the correct inflectional stress.

In (3) below we reproduce the set of the basic metrical rules of Russian as formulated in Halle (1997, p. 280).

(3) The metrical rules of Russian

i. Morphemes have idiosyncratic accents which are notated in vocabulary representations with left parenthesis on line 0.
ii. Line 0 is subject to the edge-marking rule RRR.
iii. Line 0 is subject to the head-marking rule L.
iv. Line 1 is subject to the edge-marking rule LLL.

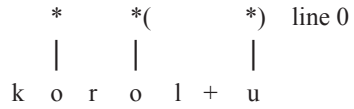
v. Line 1 is subject to the head-marking rule L.
vi. Assign high tone to the head of the word, low tone to all other line 0 elements.

We would like to point out that the formulation in (i) slightly obscures the nature of the input representations of accented morphemes. If accents are indeed 'notated in vocabulary representations with left parenthesis on line 0,' then does it mean that the entire line 0 is, in fact, encoded in the input (vocabulary representation) rather than projected? Another remark that must be made at this point is that Halle assumes that tone constitutes an obligatory stress cue in Russian. While this may be the case in some East Slavic dialects (see Bethin, 2006), we are not aware of evidence that the same is true for Standard Russian.

In the case of words composed of unaccented morphemes, line 0 rules correspond to that part in the Basic Accentuation Principle (BAP) which assigns stress to the leftmost syllable of underlyingly unaccented words. Line 1 rules choose the leftmost accented vowel as the locus of word stress – similarly to that part in the BAP which says that stress is assigned to the leftmost underlyingly accented vowel. As we see, the analysis in Halle (1997) is a continuation of earlier analyses based on the BAP. That is not to say, however, that the analysis does not contribute any new insights.

Recall that, in one of the major accentual patterns of non-derived Russian nouns, stress is fixed on the ending. To account for this pattern, Melvold (1990) posits that some accented roots are additionally marked as post-accenting. The representation of such roots requires two specifications: [+accented] and 'subject to Post-Accentuation.' Halle proposes that the inputs of post-accenting roots contain a left parenthesis placed at the right edge of the root.

Figure 1-7: Construction of line 0 projection of *korol+u* 'king' Dat. Sg



In Fig. 1-7, the foot on line 0 stretches from the left parenthesis placed after the last stress-bearing element of the root to the right edge of the word and includes only one element projected by the inflectional ending *-u*. Correspondingly, it is this element that is

chosen as the head of the foot by the head-marking rule L active on line 0; subsequently it is projected on line 1 and line 2, eventually becoming the head of the word.

The representation of post-accenting morphemes proposed by Halle is an interesting departure from the [+accented], 'subject to Post-Accentuation' marking in Melvold. Indeed, the degree of representational complexity is exactly the same for accented and post-accenting morphemes, the only difference being in whether a left bracket is placed *before* the last stress-bearing element or *after* it.

In order to account for the accentual pattern D (B^1), in which stress is on the ending in the singular and on the last syllable of the root in the plural (*kolba'su* 'sausage' Acc. Sg but *kol'basami* Inst. Pl.), Halle posits a retraction rule which inserts a left bracket before the last stress-bearing element of the stem when followed by plural case endings. We reproduce this rule in (4) below:

(4) Reproduction of the rule of Retraction (Halle, 1997, p. 283)

Insert (/ ___ * (*
S D

where S is a lexically marked stem and D stands for a plural case ending and several other suffixes

As a result of the application of the rule in (4), the last vowel of the stem becomes the head of a foot and as such is projected on line 1 and subsequently on line 2. Halle posits one more retraction rule in the environment of yers and shows that the two rules, although very similar, are both required and are in a feeding relationship. We refer the reader to the original article for further details.

1.5 The analysis of Russian stress in Alderete (1999)

1.5.1 Input representation of accent

The representational mechanism proposed in Alderete (1999)[18] employs an 'accentual feature.' The feature is defined as 'a prominence on the grid' (*op. cit.*, p. 17). This feature does not have a direct phonetic interpretation, so it can be used in the representation of both stress languages and pitch-accent ones. The issue of representation, how-however, is claimed to play a secondary role in the analysis: the model developed by the author is morphology-controlled, so the precise nature of the representation of accent is largely irrelevant. This is not to say that the choice of the metrical definition of an accent as 'a prominence on the grid' is completely arbitrary. Firstly, due to the inherently hierarchical structure of metrical representations, 'culminative accent, in a sense, comes for free' (p. 16). As the author notes, if accent is represented 'as stress-accent in one system, and for example, as a linked tone in another, then culminativity effects do not follow in both systems' (*ibidem*). Now, the original HEAD (PWD) constraint, as formulated e.g. in McCarthy (2002), demands that each phonological word have one and only one head, so obligatoriness and culminativity are packed together, so to speak, and culminativity indeed comes 'for free.' However, Hyman (2006) argues that culminativity and obligatoriness, if seen as enforced by separate constraints, allow for a non-trivial generalization concerning the typology of prominence, namely: word prominence in stress systems is necessarily obligatory and culminative, while in pitch-accent systems it is culminative but not always obligatory. Culminativity therefore does not come for free as a by-product of obligatory headedness.

The second reason why Alderete prefers a metrical definition of accent is internal to his model. As we shall presently see, the model envisages that morphology-related processes may require the reversal of faithfulness (anti-faithfulness). The fact that prominence on the metrical grid never spreads implies that there is no faithfulness constraint against this operation. Correspondingly, it is predicted that no morphological process may involve the reversal of such a constraint; that is to say, anti-faithfulness

[18] A revised version of this work was published in 2001. The 1999 version discussed here is the one usually cited in the literature; it is available online at the Rutgers Optimality Archive as ROA-309.

cannot require the spreading of accents, while it can require their deletion, insertion or movement.

We share Alderete's view that an adequate model of the accentual phenomena characteristic of free-stress systems like Russian should be able to capture the similarities between such systems and pitch-accent systems like Japanese. However, in our own work, we explore the alternative approach to the issue of representation. Acknowledging that underlying accents or 'asterisks' are dispensable in the analysis of pitch-accent systems as long as one accepts that tone can be linked in the input, we propose that the feature used to encode prominence in free-stress languages behaves in exactly the same fashion as tone. The strong version of this hypothesis would be that tone and 'stress accent' are encoded with one and the same feature. Having signalled this difference between Alderete's approach to representation and that adopted in our own work, we move on to the discussion of his model.

1.5.2 Prosodic faithfulness and post-stem default

The correspondence relations between input and output accents are governed by a number of prosodic faithfulness constraints, as in (5) below:

(5) Prosodic faithfulness constraints

MAX-PROM: Every prominence in S1 must have a correspondent in S2.

DEP-PROM: Every prominence in S2 must have a correspondent in S1.

NO-FLOP-PROM: Corresponding prominences must have corresponding sponsors and links.

The first two constraints militate against the deletion and insertion of accents respectively, while the third one requires that an accent should remain linked to its sponsor and thus bans accent movement. As we see, an accent ('a grid mark over an accented vowel') is treated on par with other autosegmental objects like moras or autosegmental features like tone. However, the author's assumption seems to be that accents cannot be floating, although NO-FLOP-PROM explicitly refers to links. Prominence faithfulness constraints are subcategorized into root faithfulness constraints, e.g. MAX-PROM$_{\text{ROOT}}$ and affix faithfulness constraints, e.g. MAX-PROM$_{\text{AFFIX}}$. It is claimed that root faithfulness is

universally ranked over affix faithfulness: ROOT FAITH >> AFFIX FAITH. For this reason, underlying accents of roots always prevail over underlying accents of inflectional endings.

One of the distinguishing aspects of the analysis is that it assumes a stress default for Russian that is different from the usual leftmost default expressed in the Basic Accentuation Principle. Alderete proposes that the default stress position is immediately after the stem.[19] The proposal is expressed in the following alignment constraint:

(6) Post-stem prominence constraint

POST-STEM-PROM (PSP) = ALIGN (PROM, L, STEM, R)

The constraint requires that the left edge of a prominence (the left edge of the vowel dominated by a grid mark) should coincide with the right edge of the stem. Consequently, the group of unaccented roots has to be redefined. Melvold (1990) and Halle (1997) analyze roots exhibiting the mobile accentual patter C (where the location of stress alternates between the initial syllable in the singular and the ending in the plural) as unaccented. In Alderete's analysis, unaccented roots exhibit the accentual pattern B (fixed stress on inflection, if present; otherwise on the last syllable of the root) – that is to say, his unaccented roots correspond to the post-accenting roots in previous analyses. Below we reproduce the tableau illustrating the generation of *stolý* 'table', Nom. Pl.

Table 1-1: Default ending stress with unaccented root (after Alderete, 1999, p. 72)

/stol + y/	MAX-PROM$_{ROOT}$	POST-STEM-PROM
☞stolý		
stóly		*!

As neither the root not the inflection is accented in the input, MAX constraints do not play a role, and the location of word ictus is chosen by the default-enforcing constraint POST-STEM-PROM. The constraint is ranked below NO-FLOP-PROM$_{ROOT}$, which militates

[19] Compare Halle's (1973) Oxytone Rule, which assigns stress to the final vowel or the first vowel of a disyllabic ending. A noun is subject to the Oxytone Rule (unless the rule is blocked) if the noun 'lacks inherent stress' (*op. cit.*, p. 317). In practice, the Oxytone Rule stresses the first vowel of the ending or, in the absence of an overt ending, the last vowel of the stem, just like Alderete's post-stem alignment constraint.

against the movement of root accents. Thanks to this ranking, underlying root accents do not shift to inflectional endings in order to satisfy POST-STEM-PROM. The anti-movement constraint also insures that accents do not shift within roots, so that disyllabic roots can be contrastively accented on either the first syllable or the second one.

The constraint POST-STEM-PROM is crucially interpreted as gradual, which is illustrated in the tableau below. The noun *topor* 'axe' conforms to the accentual pattern B: stress is assigned to the inflection; when none is present, the last syllable of the root is stressed. The tableau is a reproduction of that in Fig. 22 on p. 73 of Alderete (1999); the title is ours.

Table 1-2: Illustration of the gradual nature of POST-STEM-PROM

/topor + ø/	PROM-FAITH$_{ROOT}$[20]	POST-STEM-PROM
tópor		**!
☞topór		*!

The left edge of the accented syllable is two syllables away from the right edge of the root, so the second candidate, in which accent is separated from the default location by one syllable, is chosen as the optimal output.

The ranking MAX-PROM$_{ROOT}$, NO-FLOP-PROM$_{ROOT}$ >> POST-STEM-PROM >> MAX-PROM$_{AFFIX}$ means that stress in Russian is 'root-controlled.' An underlying root accent will always prevail over an underlying affix accent. In the absence of a root accent, accent is inserted and stress is assigned at the default post-stem location. The ranking POST-STEM-PROM >> MAX-PROM$_{AFFIX}$ is consistent with the fact that disyllabic inflectional endings can only be stressed on the first syllable.

The root-controlled model of accentuation sketched above accounts for two common patterns of stress in Russian: fixed stress on the root and fixed stress on the ending (pattern A and pattern B respectively). As for the mobile patterns C and D, in which stress shifts between the root and the ending, some additional theoretical mechanisms must be introduced before we relate the respective analyses.

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[20] Obviously, each candidate must be assigned a violation mark under root faithfulness, unless stress is assigned through a mechanism other than the insertion of an accent. The two candidates tie under DEP-PROM$_{ROOT}$, so the choice again is made by POST-STEM-PROM.

1.5.3 Dominance effects as prosodic anti-faithfulness

One of the characteristic features of free-stress systems is the existence of so-called dominant suffixes. When attached to a derivational base, they 'cancel out' any accents that may be present in the base. In Russian, for example, masculine nouns derived with the suffix *-ač* are stressed on the ending, if there is one, irrespective of whether the base root is accented or not. Alderete classifies this suffix as *dominant unaccented*. As the suffix causes the base accent to be deleted, the entire stem becomes unaccented, and stress is assigned by the post-stem default. In derived words with *dominant accented* suffixes, stress is fixed on the suffix. Alderete proposes that dominant suffixes introduce a change on the derivational base. In OT terms, they require a violation of faithfulness; below we briefly recapitulate the formalism.

The idea that outputs of derived words are evaluated for correspondence not only to their inputs but also to the output forms of their derivational bases is explored in Benua (1997). The fact that the English words formed with the suffix *-hood* preserve the original locus of stress (*viz. 'parent*, *'parenthood*) is explained by positing that the pertinent output-output faithfulness constraint chosen by the suffix (say, OO_1) overrides the metrical constraints responsible for the default assignment of stress in English. In the word *pa'rental* the original stress of the derivational base *'parent* is not preserved. The output-output faithfulness constraint chosen by the suffix *-al* (OO_2) is ranked in such a way that the main stress of the derivational base is not reproduced; instead, stress is assigned by the grammar. Note that both OO_1 and OO_2 are identical in that they require faithfulness to the original location of stress in the base '*parent*. The difference in outcome follows from the fact that OO_1 and OO_2 are ranked differently with respect to other constraints. As a result, OO_1 manages to impose faithfulness to the original location of stress, while OO_2 fails to do so. Crucially, the base of an output-output correspondence relation must be an independently occurring word. When some suffixes (*-or, -ist*, and others) are attached to a root that functions as an independent word, the resulting derived word preserves the base stress, *cf.*: '*prosecute* and '*prosecutor*. However, when they are attached to bound roots, the location of main stress in the resulting derived words conforms to the regular pattern of the English stress (heavy penultimate, otherwise antepenultimate): *am'bassador, 'warrior*, etc. In terms of transderivational (output-output) correspondence, these suffixes trigger OO correspondence when attached to an independently occurring base, so the base stress is preserved. If the base is a

bound root, OO faithfulness plays no role, and the assignment of stress is left to the grammar.

Alderete (1999) proposes that output-output constraints may require a violation of faithfulness. Such ***anti-faithfulness*** constraints are formulated by logically negating the respective faithfulness constraints. Thus, MAX-PROM ('Every prominence in S1 must have a correspondent in S2') becomes ¬ MAX-PROM ('At least one prominence in S1should not have a correspondent in S2'). Whereas the faithfulness constraint requires the preservation of all accents, its anti-faithfulness counterpart requires that at least one accent should be deleted. Every faithfulness constraint is assumed to have its anti-faithfulness counterpart.[21] The application of anti-faithfulness is limited to the base-output and base-reduplicant correspondence. Further, transderivational anti-faithfulness only affects the base of affixation: that is to say, a change introduced on the derivational affix will not satisfy anti-faithfulness. What this means, for example, is that there are some suffixes that require a root accent to be deleted but there are no roots that require a suffix accent to be deleted.

Whether or not a given suffix triggers an anti-faithful change, is its idiosyncratic property. As mentioned above, some Russian suffixes delete all accents on their derivational base, while others do not. The two groups of suffixes are traditionally referred to as dominant and recessive correspondingly. Revithiadou (1999) claims that dominance effects in Russian accentuation can be seen as a result of the mapping of morphological hierarchy onto prosodic hierarchy. Specifically, category-changing affixes show dominant behaviour, while other affixes, e.g. inflectional endings and evaluative suffixes, are recessive. Alderete points out that the nominative plural ending *-a* in masculine nouns has dominant properties; on the other hand, 'many derivational suffixes in Russian are recessive, showing that dominance is not always a property of category-changing affixes' (*op. cit.*, p. 147).[22] Correspondingly, he treats dominance as an idiosyncratic property of suffixes.

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[21] It is predicted, for example, that there are Anti-Positional-Faithfulness constraints, specifically requiring change in the most protected positions, i.e. in stressed syllables or word-initially. Alderete proposes that word-initial consonant mutation (eclipsis) in Irish is a candidate for such an analysis.

[22] Revithiadou (1999) does not claim that every derivational suffix is dominant, so Alderete's argument is somewhat off the target. In the ensuing review of Revithiadou (1999), we provide evidence that some evaluative suffixes in Russian are accentually dominant, which means that non-category-changing suffixes can be dominant, contrary to what Revithiadou claims.

Table 1-3 shows the generation of a derived noun with a dominant unaccented suffix. The deletion of the base accent follows from the ranking of the output-output anti-faithfulness constraint ¬ OO-MAX-PROM over the respective faithfulness constraint OO-MAX-PROM. For recessive suffixes, this ranking is reversed: OO-MAX-PROM >> ¬ OO-MAX-PROM. If separate constraints for dominant and recessive suffixes are assumed, the ranking is ¬ OO-MAX-PROM$_{DOM}$ >> OO-MAX-PROM >> ¬ OO-MAX-PROM$_{REC}$ (anti-faithfulness triggered by dominant suffixes outranks general OO faithfulness, which in its turn outranks anti-faithfulness triggered by recessive suffixes). Another aspect of the analysis that can be observed in the tableau is that the results of the change caused by anti-faithfulness constraints depend on the rest of the grammar: anti-faithfulness cause the base accent to be deleted, while POST-STEM-PROM assigns stress to the inflection.

Table 1-3: Generation of the dative singular form of *puzač* 'man with a paunch' (after Alderete, 1999, p. 142)

Base	/púz + ač + u/	¬ OO-MAX-PROM	OO-MAX-PROM	POST-STEM-PROM
a. púz-u	púz + ač + u	*!		
b. púz-u	puz + áč + u		*	*!
c. ☞púz-u	puz + ač + ú		*	

At this point, a remark should be made about the notion of the base as it is employed in Transderivational Anti-Faithfulness. Recall that, in the original proposal of transderivational (output-output) correspondence put forward by Benua (1997), the base must be an independently occurring word. The problem with Russian is that roots rarely occur without an inflection. In nouns, for example, zero endings are characteristic of e.g. the nominative singular case of masculine nouns and the genitive plural case of most feminine and neuter nouns. In the case at hand, the independently occurring form *puz* constitutes the genitive plural case of the respective noun, whose nominative singular form is *puzo* 'paunch.' While Alderete does not reject the original requirement of the output-output theory that a base should be an independently occurring word, he stipulates that the base does not stand in correspondence with the entire derived word and that 'only the segments of the shared morphemes stand in correspondence' (*op. cit.*, p. 121).[23] The most immediate interpretation of this proviso is that output-output corre-

[23] It is not clear whether this proviso is posited for any output-output correspondence or only to anti-faithful correspondence.

spondence holds only for the root or stem from which a given word is derived. Interestingly, both the base and the derived word in Table 1-3 are in the dative singular form and share the inflectional ending *-u*, which marks the dative singular of masculine nouns. The author does not discuss this fact, but the stipulation that 'the segments of the shared morphemes stand in correspondence' (*ibid*.) may well be interpreted as meaning that output-output correspondence is established not only on the root *puz-* but also on the shared inflectional ending *-u*. Now anti-faithfulness can be satisfied by the introduction of some change on the inflection; the significance of this will be discussed later.

The analysis in Table 1-3 shows that, when a derived word is formed with a dominant unaccented suffix such as *-ač*, the constraint POST-STEM-PROM imposes stress on the inflection thanks to the deletion of the root accent. With the root accent deleted, the entire stem becomes unaccented, and the general post-stem default applies. The prediction of this analysis is that the same accentual pattern will be observed when a *non-dominant* (recessive) unaccented suffix is attached to an unaccented root. The entire stem being unaccented, stress will be assigned to the inflection by default. Now let us imagine a slightly different situation: the same recessive unaccented suffix is attached to an accented root. Recessive suffixes do not cause anti-faithfulness effects; therefore, the original root accent will be preserved in the output. The grammar will thus produce two patterns of the accentuation of derived words formed by means of a recessive unaccented suffix: some words will be stressed on the inflection, while others will be stressed on the root. This prediction, however, is not born out: there is no derivational suffix such that some of the words derived by means of this suffix show inflectional stress, while others show stress on the derivational base. One possible explanation for this gap would be that all unaccented suffixes are dominant, which looks like an unwelcome limitation on inputs. In his discussion of the accentual properties of Russian derivational suffixes, Alderete makes a reference to Melvold's (1990) analysis of the nominal sing suffix *-ost^j* as recessive unaccented, and concludes that recessive suffixes support underlying accentual contrasts. He seems to miss the point that the set of unaccented morphemes in his analysis does not coincide - indeed, is incompatible - with the set of unaccented morphemes in Melvold's analysis. Thus, roots that are treated as unaccented in Alderete's model are analyzed as post-accenting by Melvold, while roots that are unaccented under Melvold's analysis (pattern C) are considered as accented on the first vowel by Alderete, as we shall shortly see in the discussion of his approach to mobile stress patterns. Because Melvold's analysis is based on the cyclic Basic Accentuation Principle, a word form derived with a recessive unaccented suffix on the basis of an

unaccented root will receive the default word-initial stress, and this is indeed the behaviour of the suffix *-ostʲ*. As we have just pointed out, given the post-stem default proposed in Alderete (1999), the prediction is that words composed of a recessive unaccented suffix and an unaccented root will be stressed on the inflection. If the suffix *-ostʲ* is treated as recessive unaccented in the model proposed by Alderete, then some words derived with this suffix are expected to show inflectional stress. This is not the case. Alderete provides no further examples of derivational recessive unaccented suffixes. Correspondingly, we sustain our conclusion that, if Alderete's analysis is adopted, no derivational suffixes in Russian can be analyzed as recessive unaccented, which means that recessive suffixes do not support underlying accentual contrasts. As far as recessive inflectional suffixes are concerned, it is easy to see that his model does not allow for their accentual properties to be expressed on the surface;[24] for all intents and purposes, this is tantamount to positing that inflectional suffixes do not support underlying accentual contrasts, either. Considering the fact that dominant suffixes, which are arguably more marked, have to be specified underlyingly as either accented or unaccented, the failure of recessive suffixes to support such a contrast is disconcerting.

Recall that the root-controlled accentuation of non-derived words is enforced by the ranking MAX-PROM$_{\text{ROOT}}$ >> POST-STEM-PROM >> MAX-PROM$_{\text{AFFIX}}$. The ranking MAX-PROM$_{\text{ROOT}}$ >> POST-STEM-PROM ensures that a root accent wins over an inflectional accent, while the ranking POST-STEM-PROM >> MAX-PROM$_{\text{AFFIX}}$ accounts for the fact that disyllabic inflectional endings are always stressed on the first vowel. The same ranking, however, may cause the deletion of underlying accents on derivational suffixes in order to satisfy the post-stem default. Alderete resolves this problem by positing another positional variant of faithfulness, namely MAX-PROM$_{\text{STEM}}$, which protects accents in the stem (that is, roots and word-forming suffixes). This constraint is ranked above POST-STEM-PROM and below MAX-PROM$_{\text{ROOT}}$. The effect of stem faithfulness as opposed to root faithfulness and affix faithfulness is illustrated in Table 1-4 below. The tableau presents the generation of the diminutive noun *častʲíca* from *častʲ* 'part.' The stem of the word is placed in square brackets.

[24] As we shall see, this is actually true also for those masculine plural endings which Alderete analyses as dominant.

Table 1-4: Generation of *čast'íca* (adapted from Alderete, 1999, p. 169)[25]

/[čast – íc]- a/	MAX-PROM$_{ROOT}$	MAX-PROM$_{STEM}$	POST-STEM-PROM
a. [čast – ic]- á		*!	
b. ☞ [čast – íc]- a			*

Candidate a, in which stress is in the prosodically favoured post-stem position, fatally violates the higher-ranked stem faithfulness constraint MAX-PROM$_{STEM}$. The violation is incurred by the deletion of the underlying suffixal accent. An accent is inserted on the inflectional ending in agreement with the post-stem default. Note that an identical candidate can be generated by shifting the suffixal accent to the ending. Such a candidate would satisfy all the constraints included in the tableau, as it incurs no violations of MAX. The ultimate choice of the optimal candidate would therefore belong to the constraint against accent movement NO-FLOP-PROM. This is not necessarily a flaw in the analysis though, for Alderete stipulates the necessity for such a constraint elsewhere. The real issue with the tableau is that the root *čast-* is assumed to be unaccented in the input. This is how this root can be analyzed under the model developed in Melvold (1990). The noun *čast'* is stressed on the root in the singular and in nominative/accusative plural, and on the inflection in the remaining plural cases. Under Melvold's analysis, stress is assigned by the BAP at the left edge, if there is no inflection of if the inflectional ending is unaccented; when an accented ending is attached, stress is assigned to the ending. However, as we have seen, Alderete rejects the BAP and proposes that there is a post-stem default in Russian. Correspondingly, stress in non-derived nouns formed on the basis of unaccented roots is expected to be fixed on inflections. In order to see whether our reservations are valid, we need to further explore how the theory proposed by Alderete accounts for the accentuation of non-derived nouns.

1.5.4 Output-output correspondence between singular and plural forms

It has already been mentioned that the theory of Transderivational Anti-Faithfulness (TAF) modifies the original concept of the base in output-output correspondence. The base is no longer necessarily simplex, which allows TAF to accommodate inflecting languages. Moreover, an output-output correspondence relation can be established

[25] Note that Alderete assumes that the suffix *-íc* is recessive accented. This is how it is analysed in Melvold's model. As we shall presently see, Alderete's own model is incompatible with this classification of this suffix.

between e.g. singular and plural forms of one and the same noun. Although Alderete (1999, p. 137) admits that 'there is no straightforward sense in which the inflected singular is the morphological base for the plural,' he claims that the singular constitutes the output-output base for the plural. The base in this case is determined not by a derivational relation, but by markedness. Due to the fact that the plural is morphologically more marked than the singular, a base-output pair consisting of a singular form as the base and a plural form as the output is more harmonic than a plural-singular pair. Combined with anti-faithfulness mechanisms, this notion of output-output correspondence becomes extremely powerful. A grammar equipped with such an instrument will have little problem with the generation of e.g. *feet* from *foot*. That such a result can be produced within an output-oriented framework such as Optimality Theory is remarkable.

The extension of output-output correspondence to morphologically related words that are not in a clear derivational relation is essential for the TAF analysis of the two accentual patterns of Russian in which stress alternates between the root and the ending. Recall that pattern C is characterized by root-initial stress in the singular and inflectional stress in the plural. In pattern D, the ending is stressed in the singular, while in the plural stress is 'retracted' to the root-final position. Alderete proposes that the roots exhibiting pattern C are underlyingly accented on the first syllable.[26] In the singular, the root accent is realized in the output, in agreement with the idea that root faithfulness universally outranks affix faithfulness. The singular stands in an output-output correspondence with the plural. In the plural, these roots select dominant allomorphs of inflectional endings, which trigger anti-faithfulness effects. Alderete does not specify whether these allomorphs are dominant accented or dominant unaccented, as in either case the root accent will be deleted to satisfy the anti-faithfulness constraint ¬ OO-MAX-PROM triggered by the inflection. The ranking POST-STEM-PROM >> MAX-PROM$_{\text{AFFIX}}$ insures that the outputs of the plural forms are accented on the first syllable of the ending, irrespective of whether or not the ending is accented. The analysis of pattern D goes along similar lines. This time, the root is assumed to be underlyingly unaccented, so stress in singular forms is assigned by the post-stem default. The singular constitutes the base for output-output correspondence with the plural. The plural forms select dominant allomorphs of the respective inflectional endings. These allomorphs trigger the anti-faithfulness constraint ¬ OO-DEP-PROM, which requires that an accent be inserted on the OO base – in this

[26] In analyses based on the BAP, such roots are analysed as unaccented.

case, the root. The location of the accent at the right edge of the root is achieved through the minimal violation of the gradually evaluated POST-STEM-PROM.

Let us now return to the root *čast*-, which is treated as underlyingly unaccented in Table 1-4. As we have mentioned already, the non-derived noun *čast*^{j} formed on this root shows an alternation of stress between the root (in the singular and nominative/accusative plural) and the endings (in the oblique plural cases). Under the analysis developed in Alderete (1999), the fact that the noun is stressed on the root in the singular may mean two things: either that the root is accented or that we are dealing with a dominance (anti-faithfulness) effect, where an unaccented root chooses dominant allomorphs of inflectional endings, so that stress is inserted on the last (in this case, the only) syllable of the root. The second option is consistent with Table 1-4, where Alderete treats the root as underlyingly unaccented. However, an analysis in which the singular paradigm chooses dominant endings involves an output-output correspondence with oblique plurals as the base. Given Alderete's proposal that the base of output-output correspondence between morphologically but not derivationally related words is chosen by markedness considerations, the plural, being a more marked morphological category, cannot constitute the base for the singular, so this analysis is not viable. We are left with the alternative analysis, where the root is underlyingly accented. In oblique plural cases, it chooses the dominant allomorphs of the respective inflectional endings. The endings trigger an anti-faithful deletion of the root accent, and the outputs receive the post-stem stress. We have proved that, in the model proposed by Alderete, the root *čast*- must be analyzed as underlyingly accented. Let us see what consequences this revaluation of the accentual properties of the input root would have for the analysis in Table 1-4.

Table 1-5: Generation of the diminutive *častica* from the accented root *čast*-

/[část – íc] - a/		MAX-PROM$_{ROOT}$	MAX-PROM$_{STEM}$	POST-STEM-PROM
a.	[čast – ic]- á	*!	**	
b.	[čast – íc]- a	*!	*	*
c.	☞💣 [část – ic]- a		*	**

Candidates that would involve accent movement are not included in the tableau for the purpose of consistency with Table 1-4. In the grammar proposed by Alderete, candidate *c* is incorrectly chosen as optimal thanks to the preservation of the root accent. The analysis can be saved by positing that the suffix *-ic* is actually dominant accented, so that

it triggers the anti-faithfulness constraint requiring the deletion of root accent, ¬ OO-MAX-PROM$_{ROOT}$. This solution, however, makes incorrect predictions for the nouns derived with the same diminutive suffix on the basis of pattern A roots (recall that stress in pattern A nouns is fixed on the root in all declension forms). Thus, the diminutive noun *'luž-ic-a*, built on the root of the noun *'luž-a* 'puddle,' is expected to be stressed on the suffix: **lu'ž-ic-a*. One is forced to conclude therefore that the accented suffix *-ic* has a dominant allomorph, chosen by the root of *ča'stica*, and a recessive one chosen by *'lužica.* Moreover, ***all*** the recessive accented suffixes that can be attached to pattern C roots must have dominant allomorphs. As there is no reason to believe that the distribution of suffixes is correlated with the accentual type of the roots to which they can be attached, the ultimate conclusion is that every recessive accented suffix must have a dominant allomorph. Another logically plausible possibility is that all the derivational suffixes of Russian are dominant, but some of them have recessive allomorphs that are chosen by pattern A roots and stems. In the case at hand, the root in *ča'stica* loses its accent before a dominant derivational suffix, while the root in *'lužica* chooses the recessive allomorph of the same suffix and realizes the underlying root accent.

1.5.5 Concluding remarks

Our general conclusion is that the analysis of Russian accentuation presented in Alderete (1999) needs further elaboration. As we have demonstrated, the author's assumptions about the accentual properties of some morphemes do not seem to be compatible with his own analysis of the four major accentual patterns of Russian non-derived nouns. Correspondingly, the validity of his analysis of the accentuation of derived nouns is questionable, as the inputs used for analysis are not always compatible with the rest of the model. We have not been able to identify any examples of suffixes that must be analyzed as recessive unaccented, given the author's model. Within this model, conclusive evidence for the existence of underlying accentual contrasts in affixes exists for dominant derivational suffixes only, contrary to the author's assertion that underlying accentual contrasts are supported by both dominant and recessive affixes.

The attractive aspect of the analysis based on Transderivational Anti-Faithfulness is that it directly captures the fact that, in most cases, the oscillation of stress between the root and the endings enhances the contrast between the singular and plural forms of a given word. However, sometimes this kind of stress shift occurs within the singular or plural paradigm. In the singular, the word *golo'va* 'head' is stressed on the ending in all

the cases but the accusative: *'golovu*, where stress is word-initial. In the plural, the same word is stressed on the ending in the oblique cases, e.g.: *golo'vami* Inst. Pl., but in the nominative/accusative it is stressed on the first syllable: *'golovy*. The BAP-based analysis of such words is that the stressed endings are underlyingly accented, while the root is underlying unaccented. The word-initial stress is assigned by default when an unaccented ending is attached to the unaccented root. It is not clear what a TAF-based analysis of the accentuation would look like in this case. If one assumes that the root is underlyingly accented and that the inflectional stress results from the operation of anti-faithfulness constraints triggered by dominant affixes, then it appears that the accusative singular form *'golovu* must be taken as the base of output-output correspondence for all the forms with inflectional stress. Recall that, in the Transderivational Anti-Faithfulness theory proposed by Alderete, the base for output-output correspondence between morphologically related forms which are not in a derivational relation is established on the basis of markedness consideration. If *'golovu* is indeed the OO base, then the accusative singular must be considered as less marked than the nominative singular. Alternatively, one can assume that the inflectional stress in most of the singular and plural forms of the word means that the root is unaccented, so stress is assigned by the post-stem default. Now the word-initial stress requires the insertion of an accent on the root. This kind of insertion can be attributed to the operation of the anti-faithfulness constraint ¬ OO-DEP-PROM$_{ROOT}$. The problem with this solution is that the gradual constraint POST-STEM-PROM would choose forms with the location of stress as close to the post-stem position as possible; that is to say, the constraint will incorrectly choose the accusative singular form **go'lovu* and the nominative/accusative plural forms **go'lovy* as optimal.

1.6 Prosodic hierarchy as a reflection of morphological hierarchy: the analysis in Revithiadou (1999)

1.6.1 Representation of accent

An important analysis of systems with surface-unpredictable stress, notably of Greek and Russian, performed within the Optimality Theory framework is presented in Revithiadou (1999). Our discussion of this work is going to focus on the solutions proposed for Russian, which necessarily limits the scope of presentation. The interested reader is referred to the original work for a more comprehensive outlook on the proposals it contains.

From the point of view of our own work, the most interesting proposal put forth by Revithiadou is that a lexical (underlying) accent is an autosegmental feature 'like tone' (*op. cit.*, p. 8). An accent can be floating or linked to the sponsoring morpheme and hosted by a specific vocalic peak. The feature 'accent' does not have a unique phonetic interpretation: 'If the autosegment is included in the prosodic organization of the word, it is assigned a phonetic interpretation, which is stress in a stress-accent language or pitch in a pitch-accent language' (p. 41). Accents are divided into strong and weak ones. A strong accent 'always defines the head position of a foot […]. If qualified by the stress rules of the language, it also defines the position of the primary stress of the word' (*ibidem*). We interpret this statement as meaning that an output strong accent does not *per se* define the location of word stress. This interpretation seems to be supported by the statement that a lexical accent 'is realized as high and low tone in pitch-accent systems' and 'as head and tail in lexical accent systems with a foot organization' (p. 56). Straightforward and self-evident as such statements may sound, the author translates them into OT terms in a way that leaves room for interpretation. What constraint or constraints precisely are violated by an output in which the underlying autosegment labelled 'strong accent' docks on the tail of a foot, and not on the head? Further, what constraint is violated by an output which fails to assign main stress to the foot whose head has been determined by an underlying strong accent?[27] Outputs of this kind are not

[27] If it is faithfulness, then stress is an immanent property of the autosegment named 'strong accent,' and we are dealing with something like the feature [+stress] in the case of strong accents and its counterpart feature [-stress] in the case of weak accents.

considered in the original work, so, in what follows, we take the statement that strong accents are realized as foot heads literally and assume that a strong accent has been properly processed by the grammar, if it is associated with the head of some foot in the output. The distinction between strong and weak accents is not employed by Revithiadou to account for Russian. Therefore, we shall use the term 'accent' to refer to the original notion of a strong accent, unless stated otherwise.

1.6.2 The prevalence of head faithfulness over general faithfulness

In Revithiadou's model, morphemes are either accented, in which case the accent is underlyingly linked to a vowel, unaccentable, in which case the accent is floating and preferably realized on a morpheme other than its sponsor, or else unmarked – lacking an underlying accent. Accents are subject to faithfulness constraints (Revithiadou, 1999, p. 49):

(7) Faithfulness constraints pertaining to LA (lexical accent)

MAX(LA): A lexical accent of S1 (input) has a correspondent in S2 (output).

DEP(LA): A lexical accent of S2 (output) has a correspondent in S1 (input).

These general faithfulness constraints are supplemented with positional faithfulness constraints: HEADMAX(LA), which militates against the deletion of an accent sponsored by a morphological head, and HEADDEP(LA). The morphological head of a word is 'the element that determines the categorial status of the word' (*op. cit.*, p. 20). In non-derived words, it is the root, while in derived words 'derivational suffixes are almost always heads because they define the lexical category, class or gender of the derived form' (*ibidem*). Greek and Russian are analyzed as systems in which head faithfulness prevails over general faithfulness. What this means is that, if an accent sponsored by the head morpheme competes with an accent sponsored by a non-head morpheme, the accent of the head morpheme will prevail. In this way, the hierarchical relationship between morphemes is mapped onto the prosodic structure. The following example is provided to illustrate this point: *'gorlo* from //górl-o//[28] 'throat' but *gor'lasta* 'loud-mouthed' from //górl-ást-á//. The word-final suffixes *-o* and *-a* are inflectional endings, while the suffix

[28] Throughout this section, the acute symbol (´) over a vowel marks an underlying (lexical) accent.

-ast is a derivational suffix. In non-derived words, the root is the morphological determinant of a given word: 'it determines syntactic category, class and gender' (*op. cit.*, p. 5). In the derived form *gorlasta*, 'this role is undertaken by the derivational suffix which, among other things, changes the base from a neuter noun (*górlo* 'mouth')[29] to an adjective. Inflection, on the other hand, fills in the syntactic features of number and case, but it never changes the subcategorization frame of the base' (*ibidem*).

Consider, however, the nominative singular forms of the following pair of adjectives: *gorl-ast-a* 'loud-mouthed' (feminine) as opposed to *gorl-ast-o* (neuter). The same derivational suffix *-ast* can thus form a neuter adjective as well as a feminine one. Nor do roots of non-derived adjectives determine the grammatical gender: *molod-á* 'young', fem. but *mólod-o* neut. As we see, the same root can form both a feminine and a neuter adjective (and, indeed, a masculine one: *mólod*). Keeping these reservations in mind, let us move on to a different type of derivational suffixes.

All the constituent morphemes of the noun *'jamišča* 'pit' augm. are underlyingly accented: //jám-íšč-á//. According to Revithiadou (1999, p. 5), the augmentative suffix *-išč-*,

> 'together with other evaluative suffixes, does not exhibit any of the characteristics of headedness. It is transparent to the syntactic category, gender and class of the base to which it is attached.[30] It forms neuter nouns from neuter bases, feminine nouns from feminine bases, and so on. In other words, it behaves like an inflectional, rather than a derivational suffix. This morphological information is exactly reflected in the prosody. The structural weakness of the suffix is conveyed to the prosodic component of the grammar which then assigns prominence to the accent of the dominant element in the structure, namely the root.'

So, there are two types of derivational suffixes. Category-changing suffixes are morphological heads, and their accents prevail over root accents, while 'transparent' suffixes are not morphological heads and, correspondingly, their accents only surface, if the head of the respective word has no underlying accent.

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[29] The proper gloss is 'throat' – A.D.

[30] In the case at hand, the non-derived noun *'jama* 'pit' corresponding to the augmentative *'jamišča* is also a feminine noun – A.D.

Consider, however, the accentuation of the following derivationally related nouns:

(8) An evaluative suffix as the prosodic head

bu'mag-a 'paper' Nom. Sg; *bu'mag-i* Gen. Sg; *bu'mag-ami* Instr. Pl.

buma'ž-onk-a 'paper' dim./pejor. Nom. Sg[31]

In the nominative singular form of the non-derived noun *bumaga*, both the root *bumág-* and the inflectional ending *-á* are underlyingly accented. As predicted by Revithiadou's model, faithfulness to the root, which is the morphological head of the word, prevails over faithfulness to desinence, so it is the root accent and not the desinence accent that is realized on the surface. The other noun is derived with an evaluative suffix. According to Revithiadou, evaluative suffixes do not 'exhibit any of the characteristics of headedness.' What this means is that the root should remain the morphological head in *bumažonka*. The prosodic consequence of this should be the prevalence of the root accent over the suffix accent. This is clearly not the case, as the augmentative noun is stressed on the suffix, and not on the root.

Melvold (1990) provides another example of a dominant evaluative suffix that must be analyzed as dominant. Diminutives derived from masculine nouns by the use of the suffix -Ek[32] are post-accenting: they are stressed on the ending or, if no overt ending is present, on the suffix, irrespective of the accentual properties of the base root. Thus, the diminutives formed on the basis of *šum* 'noise' (class A), *kust* 'bush' (class B), and volos 'hair' (class C) are all stressed on the suffix in the nominative singular: *šu'mok*, *ku'stok*, *volo'sok*.[33] Compare this to the accentuation of alternative diminutives formed with the suffix *-ik*: *'kustik*, *vo'losik*. In the chapter on Belarusian, we show that the evaluative adjectival suffix *-avat* has to be considered dominant. Examples of non-dominant category-changing suffixes also exist. Melvold (1990, p. 200) classified the adjectivizing suffixes *-ist* and *-liv* as recessive accented. The highly productive adjectivizing suffix *-ov* is said to have three allomorphs: two dominant ones and one recessive (op. cit., p. 207). The thematic verbalizing suffixes *-i*, *-e*, and *-a* are analyzed as recessive accented (*op. cit*., p. 241).

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[31] The morphological division is based on the academic grammar of Russian (Švedova, 1980)

[32] The capital E stands for a front yer vowel.

[33] The examples are from Melvold (1990, p. 74).

In view of this and similar examples, one is forced to conclude either that the claim that morphological headedness is directly translated into prosodic headedness is too strong or that, in the case of some morphemes, the status of the morphological head is assigned arbitrarily. Such suffixes would have to be exceptionally specified as morphological heads despite their evaluative rather than category-changing function. Similarly, some category-changing suffixes must be arbitrarily barred from being the morphological heads. This solution, however, significantly reduces the attractiveness of the original proposal.

Let us return to the discussion of faithfulness constraints pertaining to lexical accents. Next to the MAX and DEP constraints, which ban the deletion or insertion of lexical accents, there is a constraint against the movement of accents: *FLOP. The constraint states that the output correspondent of an accent must dock to the output correspondent of the peak to which this accent is associated in the input. For obvious reasons, the application of this constraint to floating accents is vacuous. The constraint that forces floating accents to be realized on a morpheme different other than its sponsoring morpheme is *DOMAIN. This constraint assigns a violation mark whenever an accent docks to its sponsoring morpheme. Being ranked below *FLOP, this constraint cannot force underlyingly associated accents to move to another morpheme in the output.

If an input does not contain any accented morphemes, stress will be assigned by the leftmost default:

(9) EDGEMOST-L

A peak of prominence lies at the left edge of the word.

EDGEMOST-L is ranked below faithfulness constraints, and therefore cannot choose between competing underlying accents. This is different from the traditional Basic Accentuation Principle, which assigns stress either to the leftmost accent or to the leftmost syllable, if no accent is present.

1.6.3 The role of prosodic well-formedness

Before we move on to the discussion of how the main accentual patterns of Russian are accounted for in the model developed in Revithiadou (1999), another aspect of the model has to be presented: the role of prosodic well-formedness. It is claimed that, although a lexical accent can occur on any given vowel of its sponsoring morpheme in the input, its output position is prosodically controlled. Specifically, 'prosodic constraints and wellformedness principles force lexical accents to positions that create binary prosodic words called templates' (*op. cit*., p. 3). The binary nature of these words is determined by hierarchical alignment (pp. 97-98):

(10) Hierarchical alignment

Every prosodic constituent is aligned with some prosodic constituent that contains it.

Revithiadou proposes a more specific version of hierarchical alignment as a constraint:

(11) Hierarchical alignment (HIERAL)

A lexical accent is left/right aligned with the prosodic constituent that contains it, a syllable is left/right aligned with the prosodic constituent that contains it, a foot is left/right aligned with the prosodic constituent that contains it.

Under trochaic footing and hierarchical alignment, structures like ('σσ), σ('σ), σ('σσ), ('σσ)σ, (σσ)('σσ) and other strictly binary structures are well formed, while e.g. σ('σσ)σ is not. The assumption is that an underlying accent always surfaces at a location that ensures the 'ideal' prosodic shape of the resulting word form. We shall provide an illustration of this point presently; before that, however, some remarks concerning the hierarchical alignment constraint in (11) will not be amiss. According to Revithiadou, the constraint in (11) 'has a stricter reading' than the principle in (10). Namely, 'it only evaluates words that contain a lexical accent. It does not apply to words that lack a lexical accent' (p. 98). Now, how exactly does one preclude this (or, indeed, any other constraint) from evaluating words that lack a lexical accent? The constraint itself does not require every word to have a lexical accent: it only determines the alignment properties of an accent which is present in the output. What this means is that a word form

without a lexical accent cannot possibly incur a violation of the accent-related requirement of the constraint and is further evaluated with respect to the alignment of syllables and feet – even if it has no prosodic structure at all. The need for the extraordinary proviso that HIERAL in (11) only evaluates words with a lexical accent becomes evident when we analyze forms that lack underlying accents in Greek. Following Revithiadou, we assume that modern Greek is a trochaic system with exhaustive parsing and a preference for binary feet; unary feet are only possible if formed by an accented syllable. The default stress location is antepenultimate. In this system, a four-syllable input //σσσ+σ// composed of a trisyllabic root and a monosyllabic ending, with neither morpheme having an underlying accent, will be parsed as σ('σσ)σ with the default antepenultimate stress and a single trochaic foot.[34] Neither edge of the foot is aligned with the edges of the prosodic word; correspondingly, the form violates the requirement of hierarchical alignment. The only way to circumvent this problem is to stipulate that HIERAL does not evaluate words with no underlying accents. In our opinion, however, there is no obvious way in which this proviso can be enforced.

Now let us see how HIERAL is supposed to affect the input-output mapping of Russian words with underlying accents. The feminine noun *čeče'vica* 'lentil' is stressed on the third syllable throughout the declension, which means that its stem is underlyingly accented. Revithiadou proposes to construct a grammar that can produce the correct output from any input containing an accent on this stem, irrespective of whether the accent is floating or associated and, if associated, irrespective of its position in the input. Apparently, this property of the grammar follows from the OT principle of the Richness of the Base, at least this is how we interpret the discussion of accented roots in Greek (see Revithiadou, 1999, p. 100). According to Prince & Smolensky (2004, p. 62), the thesis of the Richness of the Base 'holds that *all* inputs are possible in all languages.' So, Revithiadou is correct in insisting that the grammar of Russian should be able to process inputs of accented roots irrespective of the association status or location of the accent. However, whether or not these inputs result in *identical outputs* is grammar-specific and has nothing to do with the Richness of the Base. Both the grammar of Russian and the grammar of Arabic must be able to handle inputs with the voiceless bilabial plosive //p//; however, only the former will process such an input faithfully, whereas the latter will

[34] Note that stress here is not an expression of an output accent; the default antepenultimate ictus is determined by the metrical default, and not through the insertion of an accent. The constraints at play are FOOT=TROCHEE, NONFINALITY, ALIGNPRW-R.

minimally change the input to [b] in accordance with its markedness settings. Now we see that Revithiadou's requirement that the grammar of Russian should produce the same output *čeče'vica* from inputs in which the accent is floating or associated to any of the three stem vowels is entirely arbitrary. Moreover, it is bound to produce incorrect results in Russian. The non-derived masculine nouns *'voron* 'raven' and *mo'roz* 'frost' are invariably stressed on the same root vowel throughout the declension, which means that they have to be analyzed as accented in the input. If the location of the input accent is indeed immaterial, as Revithiadou insists when analyzing *čeče'vica*, then the grammar must have a way of generating the output *'voron* from the input //vorón// and the output *mo'roz* from the input //*móroz*//. Considering that the syllable structure (and, correspondingly, the metrical structure) of the two words is identical, such a grammar would not be easy to construct.

All the reservations notwithstanding, let us assume that Revithiadou is correct in proposing that one of the valid input forms of the root *čečevic-* has an accent associated to the second vocalic peak rather than the third one. Below we reproduce the tableau which illustrates the processing of the form *čečevicy*, which Revithiadou glosses as the nominative plural form of *čečevica* 'lentil.' According to dictionaries of Standard Russian, the word *čečevica* is uncountable when used in the sense 'lentil.' However, the form *čečevicy* does exist as the genitive singular of *čečevica* 'lentil.'

Table 1-6: The accentuation of *čeče'vicy* 'lentil', Gen. Sg (adapted from Revithiadou, 1999, p. 138)

čečévic-y	FAITH(LA)	HIERAL	*FLOP
☞ a. (čeče)(vícy)			*
b. če(čevi)(cý)		*!	*
c. če(čévi)cy		*!	

FAITH(LA)[35] assigns no violation marks, because the underlying accent of the root is realized on some syllable in all the outputs. Candidates *c* and *b* are excluded by HIERAL, as neither of them is binary: the foot (čevi) is not aligned with a word edge. *FLOP, the

[35] LA = lexical accent. In the original text, the constraint is referred to as FAITH(HEAD). 'Head' in this case indicates faithfulness to strong accents as opposed to weak accents; faithfulness to weak accents is expressed by FAITH(TAIL). As faithfulness to weak accents is not relevant for Revithiadou's analysis of Russian, we've replaced FAITH(HEAD) with FAITH(LA) to avoid confusion with faithfulness to *morphological* heads (HEADFAITH).

constraint that bans the movement of an underlyingly associated accent to another peak in the output, is violated by both candidates *a* and *b*. Candidate *a* is chosen due to the fact that HIERAL is ranked above *FLOP. Note that there is at least one more candidate that can be chosen by this ranking: (čéče)(vicy). Although this candidate incurs a violation of * FLOP, it satisfies the higher-ranked constraint HIERAL. Therefore, the ranking in Table 1-6 would choose two candidates rather than one.

The situation becomes even more confounding, if a disyllabic case ending is added. The instrumental singular ending *-ej* has an extended version *-eju*. Let us see whether the ranking in Table 1-7 can generate the desired output *čeče'viceju*.

Table 1-7: HIERAL in the assessment of forms with disyllabic inflections

čečévic-eju	FAITH(LA)	HIERAL	*FLOP
a. (čeče)(více)ju		*	*
b. če(čevi)(céju)		*	*
☞💣c. če(čévi)(ceju)		*	
d. (čéče)(vice)ju		*	*

In all the candidates, there is one foot which is not aligned with a word edge. As a result, the choice is made by *FLOP in favour of the most faithful candidate, so the ranking fails to choose the correct output. Clearly, Revithiadou's attempt at modelling a grammar of Russian that would generate correct outputs irrespective the place of association of input accents is unsuccessful.

Let us assume, however, that the ranking in Table 1-7 or some other ranking can indeed correctly generate the output *čeče'vicy* both from the input //čečévic-y//, in which the underlying accent is linked to the second vowel, and from //čečevíc-y//, where the accent is linked to the third vowel. When the desired output is generated from the input //čečévic-y//, the grammar assigns a violation mark under *FLOP. The very same output generated from the input //čečevíc-y// does not incur a violation of *FLOP. Therefore, although the two outputs are absolutely identical and have been generated by the same grammar, the one generated from the input //čečevíc-y// is more *harmonic*. Under the OT principle of *Lexicon Optimization*, the input of the more harmonic output will be stored by the learner.

In Greek, HIERAL can be used to account for the lack of trisyllabic roots with an underlying accent on the second syllable of the root. Indeed, let us assume that such a root exists. Then the faithful processing of a noun composed of this root and an inflectional ending will result in a prosodically illicit form: σ('σσ)σ. If HIERAL is ranked above *FLOP, then the shift of the underlying accent is allowed, provided the resulting word form has a proper prosodic structure: (σσ)('σσ). Note that if the accent is shifted on the first syllable, the prosodic structure will be optimal, but stress would fall outside of the trisyllabic window: ('σσ)(σσ). If, on the other hand, the accent is shifted to the ending, the resulting prosodic structure will not be optimal: σ(σσ)('σ). Correspondingly, Revithiadou posits the following ranking relationship between faithfulness to lexical accents and well-formedness: FAITH TO LA >> WORDFORM >> FAITH TO THE POSITION OF LA. Given this ranking, a single underlying accent will always be realized, although it can be shifted from the original location, if so required by prosodic well-formedness.

The well-formedness requirements expressed in HIERAL become relevant only in the case of roots longer than two syllables, at least if we limit ourselves, as Revithiadou does, to forms with monosyllabic endings. Given the preference for binary feet, no trisyllabic word form consisting of a disyllabic root and a monosyllabic inflectional ending can be parsed into more than two prosodic constituents, which is to say that all such words have an ideal prosodic (templatic) form: σ('σσ), ('σσ)σ, (σσ)('σ). As we have noted above, when a disyllabic ending is added, the templatic regularity of the resulting word form cannot always be sustained: σ('σσ)σ, ('σσ)(σσ), (σσ)('σσ). Namely, when a disyllabic desinence is added to a Russian A-pattern disyllabic root with a fixed stress on the second syllable, the resulting word form is prosodically ill-formed (does not satisfy HIERAL), and the grammar proposed by Revithiadou incorrectly predicts a shift of the stress from the second syllable of the root to another syllable, i.e. σ('σσ)σ → ('σσ)(σσ) or (σσ)('σσ). The only way to circumvent the problem is to stipulate that HIERAL can only evaluate word forms with monosyllabic inflectional endings, adding another unwarranted limitation on its evaluative capacity[36] (as mentioned earlier, Revithiadou stipulates that the constraint only applies to words with at least one accent in the input). Let us however abstract away from the explicit and implicit limitations on HIERAL and focus on its *raison d'être* within the proposed model of Russian stress.

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[36] Revithiadou does not make such a stipulation explicitly. However, when discussing prosodic templates she only considers monosyllabic inflections.

According to Revithiadou, the input accents of accented trisyllabic roots in Russian tend to be associated either to the first syllable or to the last one.[37] In fact, the claim is even stronger: the underlying accents of native trisyllabic roots never associate to the second syllable of the root. This gap is supposed to be due to the inability of such roots to form prosodically ideal (templatic) word forms when inflected: σ('σσ) + σ = σ('σσ)σ. Given the ranking FAITH TO LA >> WORDFORM >> FAITH TO THE POSITION OF LA, any such accent would be shifted from its input position by the grammar, so that an underlying accent associated to the second syllable of a native trisyllabic root would never get a chance to surface in this position. The constraint responsible for the existence of this gap is HIERAL. The question is, however, how important it is for phonology to be able to account for such a gap, especially if we consider the fact that almost all native Russian roots are monosyllabic. The relevance of an accentual gap in native trisyllabic roots, if such a gap does exist, is therefore marginal at best.

In conclusion of our discussion of the relevance of prosodic templates to Russian accentuation, we would like to mention that Revithiadou posits a different constraint ranking for borrowings, which are regarded as constituting a peripheral sector of the lexicon. The following ranking holds for borrowings: FAITH TO LA & FAITH TO THE POSITION OF LA >> WORDFORM. This ranking allows borrowing with trisyllabic roots to have stress fixed on the second syllable in violation of prosodic well-formedness requirements: *po(líti)ka* 'politics.' As borrowings become more deeply integrated in the native lexicon, the stress may shift to a prosodically preferred position: *ma('gazi)ny* 'shops' Nom. Pl. → *(maga)('ziny)*. The competing, prosodically ideal form *('maga)(ziny)* is excluded by ALIGN-R,[38] which requires that lexical accents be aligned with the right edge of the word. One objection that may be raised in this connection is that roots like *politik-* are otherwise seamlessly integrated into the native system: they form nouns that are declined and, depending on their semantics, may form plural forms (e.g. *politiki* 'politicians'), they are even subjects to native alternations, e.g. the First Velar Palataliza-

[37] One of the forms cited in the original work to illustrate the accentuation of nouns with trisyllabic roots, namely *jáščeric-a* 'lizard' may well be derived (or analyzable as derived), cf. *jáščer* 'pangolin.' We assume, however, that the accentual generalization refers to bare roots rather than suffixed and/or prefixed stems. Russian words with derived trisyllabic stems are quite often stressed on the second syllable of the stem: *igr-úš-eč-k-a* 'toy' dim., *po-slóv-ic-a* 'proverb,' *ris-ún-ok* 'drawing,' etc.

[38] Align-R is formulated as requiring lexical accents to be aligned with the right edge of the word. If construed as a gradual constraint, it would assign one violation mark to *maga'ziny* and three violation marks to *'magaziny*. Of course, if the constraint is categorical, it cannot choose between the two candidates.

tion in *politič-esk-ij* ‘political.’ If they indeed form a special group within the lexicon, then the medial location of the accent is the only feature that sets them apart from the rest of the lexicon.

1.6.4 The issue of prosodic well-formedness in Russian

Having presented the pros and cons of an approach in which prosodic well-formedness plays in important role in the accentuation of Russian words, we would like to take a closer look at what is and what is not prosodically well-formed in Russian. According to Revithiadou, Russian has a bimoraic word minimum, evidenced by the presumed lack of monomoraic content words. CVC words are considered as being in conformity with the bimoraic minimum thanks to the moraicity of coda consonants. However, monomoraic content words do exist: *tlʲa* ‘aphid’, *dno* ‘bottom’ n, *rža* ‘rust’ n, *bʲju* ‘I beat’, etc. While the prototypical form of a Russian root is indeed CVC, the underlying vowel may be a yer – a floating vowel which only gets vocalized under certain conditions. The root of *dn-o* is /dOn/, where O represents a back yer. However, the yer does not surface when the inflectional suffix *-o* is attached and, as a result, the surface form is monomoraic.

Another assumption about the metrical structure of Russian made by Revithiadou which cannot be accepted without reservations is that the foot is trochaic. Halle and Vergnaud (1987) claim that Russian is an iambic system on the basis of the leftward stress shift from non-vocalized yers: *za'jom* ‘loan’ n, Nom. Sg as opposed to *'zajma* Gen. Sg. In her turn, Revithiadou cites Idsardi’s (1992) observation that the rightward shift of stress from non-vocalized yers is also possible and, indeed, prevalent: cf. *o'tʲec* ‘father’ Nom. Sg and *ot'ca* Gen. Sg. This is taken as an argument in favour of trochaic footing. More arguments come from elision, secondary stress, and vowel reduction.

Fast speech elision is exemplified by *napisatʲ* ‘to write’, which, according to the sources cited in Revithiadou, can be pronounced as [nʌ'psatʲ]. The analysis is that the first vowel is not elided because, in the regular pronunciation of the word, the initial syllable is the head of a secondary foot: (napi)('satʲ). We must point out, however, that, should the first vowel undergo elision, the resulting form *[npi.satʲ] would be disfavoured for syllable structure reasons: [np-] is not a well-formed onset in Russian. Next, Revithiadou quotes the form *unir'stet* for *universi'tet* ‘university’ and points out that the reduced form can be analyzed as consisting of two trochaic feet. The final example is the acronym SSSR ‘USSR’ [ˌɛsəsɛs'ɛr], whose reduced forms are [ˌɛsəsəs'ɛr], with a schwa

in the pretonic syllable or even [əs'ɛr], with elision. The word-initial secondary stress together with the reduction/elision pattern is taken as evidence of trochaic footing.

Of course, we are not in a position to embark upon an extensive discussion of the interpretation of evidence from vowel elision, as that would require a much more representative sample of data. As we have pointed out, the first example allows for an alternative explanation based on syllabification. Some of the examples collected by Kodzasov (1973) contradict an explanation based on iterative trochaic footing. For instance, fast speech elision in [səsʲtʲi'zanʲije] 'contest' results in the form [s:tʲi'zanʲije]. The first vowel is elided despite the fact that the initial syllable is presumably footed as the head of a foot: (səsʲtʲi)('zanʲi)je; the same applies to [lʲdʲi'nɔj] for [lʲidʲi'nɔj] 'icy.'[39] On the other hand, Kodzasov (*op. cit.*) notes that the syllable directly following the stressed syllable is especially prone to elision, at least when surrounded by identical consonants, so the position of a given syllable in the word does play a role. It seems, however, that Revithiadou's conclusion that elision provides unequivocal evidence in favour of exhaustive trochaic footing is premature.

The accentuation of compounds is taken to be another source of evidence for trochaic footing; the examples used to illustrate this point are: (ˌfoto)gra('vjura) 'photogravure,' (ˌmoto)pe('xota) 'motorized infantry,' and (ˌrevo)lju('cionnyj) 'revolutionary.' The generalization is that 'polysyllabic words have audible secondary stress on the initial syllable' (Revithiadou, 1999, p. 151).

There are reasons to believe, however, that the actual situation is much more complicated. Firstly, many authors maintain that Russian tends not to have secondary stress in polysyllabic words other than compounds (Gouskova, 2010; Matusevič, 1976) and some prefixed words (Švedova, 1980). Out of the three examples provided by Revithiadou, the first two are compounds; dictionaries (Borunova, Voroncova, & Es'kova, 1988; Zaliznjak, 1977) list them as allowing a secondary stress. The third example is listed with one stress: *revoljuci'onnyj*. Examples with a secondary stress on syllables other than the first one are plenty: *beˌtonome'šalka* 'concrete mixer,' *eˌlektropri'vod*

[39] The symbol [i] in unstressed syllables is used as a first approximation; see our remarks on vowel reduction in Russian below. The cluster [lʲd-], although violating sonority requirements, does occur word-initially in e.g. [lʲda] 'ice' Gen. Sg., ['lʲdʲinkʌ] 'a (small) piece of ice'; the lateral is not perceived as syllabic, so [lʲda] contains one syllable, and ['lʲdʲinkʌ] two.

'electric drive,' *samo¸ljotostro'jenije* 'aircraft construction,' etc. It is clear that Revithiadou's generalization about word-initial stress in polysyllabic words is too strong.

Further on in this chapter, we briefly discuss Gouskova's (2010) article on Russian compounds. According to her, compounds may receive a secondary stress only if the first stem is underlyingly accented (belongs to the accentual pattern A). The location of secondary stress corresponds to the original location of accent, cf. *be'ton* n, 'concrete' and *be¸tonome'šalka*. If the first stem of a compound is unaccented or post-accenting (patterns C, B, and D) it will not be assigned a secondary stress: *golovokru'ženije* 'vertigo' (literally, head-turning), the first stem consisting of the unaccented root *golov-*. By and large, Gouskova's (2010) generalization is correct. However, dictionaries do register secondary stress in some compounds whose stems do not belong to the accentual pattern A: *¸cenoobrazo'vanije* 'price formation' from *ce'na* 'price'; *¸jajcezago'tovki* 'eggs procurement' from *jaj'co* 'egg.' Interestingly, secondary stress in such words is indeed placed on the initial syllable. On the other hand, the initial syllable of the first stem is also stressed in the nominative plural forms of the respective nouns: *'ceny* 'prices,' *'jajca* 'eggs,' so there is a possibility of e.g. an output-output correspondence.

The situation is much simpler as far as *emphatic* secondary stress is concerned: it is invariably word-initial. Emphatic stress may appear in words that normally do not bear a secondary stress: *¸paro'vozy* 'steam locomotives,' sometimes even next to the main stress: *¸av'tobusy* 'buses'(Kuznecova, 2006). [40] When emphatic stress appears in words that normally bear a secondary stress, the secondary stress is removed in favour of the word-initial emphatic stress: *¸elektropere'dača* 'electricity transmission' instead of *e¸lektropere'dača*. Moreover, an emphatic stress may be more prominent than the original word stress, *cf. 'dore¸formennyj* 'pre-reform' in place of *dore'formennnyj* (Kalenčuk & Kasatkina, 1996). While the 'regular' secondary stress must be separated from the main stress by at least two syllables, emphatic stress may be placed even next to the main stress (Kuznecova, 2006). Last but not least, while vowels under 'regular' secondary stress escape reduction, vowels under the word-initial emphatic stress are subject to reduction and, more often than not, cannot be realized as full vowels irrespective of the degree of emphasis (*ibidem*). We see that the two types of secondary stress

[40] The last example shows that Kuznecova is probably incorrect in classifying this type of secondary stress as 'rhythmic' as opposed to the regular secondary stress, which she labels 'rhythmo-semantic.'

have very different properties. Kuznecova proposes that the regular secondary stress is assigned at the word level, while the emphatic stress – at the phrasal level.

Whatever evidence the patterns of secondary stress might provide in favour of exhaustive trochaic footing, such evidence is scanty and inconclusive. Invariable word-initial position is indeed a property of the emphatic stress, but not of the 'regular' secondary stress. Emphatic stress does not provide any indication as to the presence and nature of metrical structure, since it is assigned completely independently of the main stress. The location and presence of the 'regular' secondary stress depend on the underlying accentual properties of the respective stem. Another factor affecting the presence of a secondary stress is the distance from the main stress: at least two syllables must intervene between the two stresses. If one assumes trochaic footing, then there must be at least one syllable between the boundaries of the feet containing the too stressed syllables: (ˌfoto)gra('vjura), which may be interpreted as a clash avoidance strategy. This perhaps could be taken as evidence in favour of trochaic footing. Evidence for the exhaustive character of footing can be seen in the occurrence of a word-initial secondary stress in e.g. *ˌjajcezago'tovki*. On the other hand, the compound *golovokru'ženije* lacks a secondary stress, although the number of pretonic syllables is the same, so factors other than metrical structure are involved.

The next group of arguments put forward by Revithiadou in favour of exhaustive trochaic footing pertains to vowel reduction. Before discussing the arguments, we would like to briefly introduce the most relevant facts concerning vowel reduction in Russian, based mostly on their presentation in Matusevič (1976). In contemporary Standard Russian, the mid vowel //e//, when preceded by a palatalized consonant, is neutralized in all unstressed positions and is realized as a slightly centralized [i] in the immediately pretonic syllable and as a raised and fronted schwa in other word-internal unstressed syllables. Its pronunciation is unstressed syllables is essentially the same as that of /i/, so in ensuing transcriptions we shall render it as [i]. The low vowels //a// and //ɔ// are also neutralized in unstressed syllables. Following a non-palatalized consonant in the immediately pretonic syllable, they are realized as [ʌ] (also transcribed as [ɐ]). In other unstressed positions, the vowels are reduced to schwa [ə]. The reduction to schwa, however, does not apply to word-initial onsetless syllables, cf. the pronunciation of *ogorod* [ʌgʌ'rət] 'kitchen-garden' and *moloko* [məɬʌ'kɔ] 'milk.' In word-final open syllables, the reduction to schwa may not be carried out in careful speech, so the neutralized vowel is pronounced as [ʌ]. While the resistance of word-initial onsetless vowels to

the reduction to schwa may be explained as a word-edge effect, the resistance to reduction of the immediately pretonic syllable calls for a more principled explanation.

However, the discussion of vowel reduction in Revithiadou is conducted to the explicit exclusion of the immediately pretonic syllable. The decision not to take the immediately pretonic syllable into account is based on the realization of intonation contours. Revithiadou quotes the description of the rise-fall intonation contour in Russian presented in Odé (1989). The pitch movement is spread over two syllables: the immediately pretonic one and the stressed one. Revithiadou concludes that that 'there is a special bond between the pre-stressed and stressed position' and hypothesizes that 'the lesser degree of reduction in the pre-stressed position is owed to the rising-falling pitch that is associated with the accented syllable' (Revithiadou, 1999, p. 153). Because the behaviour of the immediately pretonic vowels with respect to reduction is a constant, the assumption here seems to be that pitch movement is a necessary correlate of stress. This is in fact true of some East Slavic dialects (for an overview see Bethin, 2006), but Standard Russian is not one of them. Revithiadou's proposal that 'pitch protects pre-stressed vowels from total reduction' allows her to place the pretonic syllable issue outside the scope of discussion: 'Since this issue relates to aspects of Russian accentuation that are not in focus here, pre-stressed vowels are not accounted for, neither they are evaluated in the tableaux that follow' (*ibidem*). We shall see the relevance of this decision presently.

As we have already mentioned, Revithiadou posits exhaustive trochaic footing for Russian. Binary feet are preferred, but stressed unary feet are also allowed: 'syllables are parsed into binary feet unless faithfulness requirements to a lexical accent enforce a monosyllabic foot' (p. 130). Correspondingly, a word like *golová* 'head' is parsed as composed of two trochaic feet: (gə.ɬʌ)('va). Now it becomes clear why the immediately pretonic syllable must remain outside the scope of discussion: the nucleus of the purported head syllable of the foot (gə.ɬʌ) is reduced to schwa, while the nucleus of its tail, containing the pretonic vowel, is not. If anything, one should expect the reverse to take place.

The fact that the presumed head of a foot is reduced to schwa is accounted for by the proposal that unstressed open syllables are subject to reduction 'regardless of the prosodic role they have in the structure' (Revithiadou, 1999, p. 155). Correspondingly, unstressed open syllables do not provide any evidence concerning the metrical structure of the respective word: their behaviour with respect to reduction will be the same in head

positions as in tail positions. Closed syllables, in their turn, are claimed to be able to provide evidence as to the metrical structure of a given word. According to Revithiadou, the nuclei of pre-stressed CVC syllables 'never exhibit the maximum degree of reduction' (p. 153). More specifically, 'the vowels /a, o/ always reduce to [ʌ]', while 'the front vowel /e/ is raised to [i] in closed syllables' (*ibid.*) and under secondary stress (*sic*!).

It must be pointed out here that none of the sources we have consulted (Avanesov, 1956, 1984; Bondarko, 1977; Matusevič, 1976; Panov, 1967; Švedova, 1980; Vinogradov, 1971) confirms that syllable structure in Standard Russian has any influence whatsoever on the reduction of vowels word-internally. The only cases where syllable structure is relevant are word-initial and word-final unstressed syllables, for there the degree of reduction depends on whether or not the syllable has an onset (if word-initial) or coda (if words-final). One factor relevant for all unstressed vowels is whether the preceding consonant is palatalized or not. Word-internally, vowel reduction depends on the position of a given syllable with respect to the stressed syllable. Other factors are the tempo and register of speech. However, for the sake of argument, in what follows, we give the proposal that syllable structure affects vowel reduction the benefit of the doubt.

The examples adduced by Revithiadou in support of her claim that /ɔ/ and /a/ are not reduced to schwa in pre-stress CVC syllables are these: *s[ʌ]dvo'k[a]tom* 'with (a) solicitor'; *v[ʌ]fg[ə]ni'st[a]ne* 'in Afghanistan'; *p[ʌ]dzy'vat'* 'to call up' (p. 154). The first two examples are prepositional phrases: *s advokatom*, *v Afganistane*; the second example is prefixed: *pod-zyvat'*. Let us assume that the initial vowel in all these examples indeed fails to reduce to schwa and take a closer look at the first example, *s advokatom*.

According to Revithiadou, the word is syllabified as follows: [sʌd.vʌ.'ka.təm] (p. 154). Thus, it contains two closed syllables; the nucleus of the first closed syllable is realized as [ʌ], and the nucleus of the second one as [ə]. The author explains the difference in the behaviour of the two closed syllables with respect to reduction by their different status in the metrical structure: (sʌd.vʌ)('ka.təm). The nucleus of the first closed syllable is protected by its role as the foot head. The second closed syllable is a foot tail, and therefore its nucleus is subject to reduction. In this way, closed syllables are supposed to provide evidence as to the existence of metrical structure outside of the stressed foot.

It is well established, however, that Russian prefers open syllables or, in other words, maximizes onsets, provided that the sonority sequencing is preserved (Avanesov, 1956; Knjazev, 1999; Panov, 1997). In our case, it means that the preferred syllabification is sa.dvo.ka.tom, so the first syllable is actually open. Therefore, if the first vowel is indeed pronounced [ʌ], Revithiadou's claim that low vowels are reduced to schwa in all open syllables, apart from the stressed and the immediately pretonic ones, cannot be upheld. Here we would like to remind the reader that, according to all our sources, word-initial onsetless vowels in Russian are never reduced to schwa, so the noun form *advokatom* is pronounced [ʌdvʌ'katəm] in isolation. The purported failure of the first vowel of the prepositional phrase *s advokatom* to reduce to [ə] can now be explained by assuming that onsets contributed by prepositions do not affect the behaviour of originally onsetless word-initial nuclei due to output-output faithfulness or a special status of prepositions within prosodic words. The same reasoning would apply to the prepositional phrase *v Afganistane*, so the fact that its initial syllable is closed is irrelevant. We conclude that the examples, even if correctly transcribed, do not provide evidence as to whether low vowels are more resistant to reduction in closed syllables vis-à-vis open syllables. In the third example, *podzyvat'*, the initial vowel is located in the prefix *pod-*, therefore its alleged failure to reduce to schwa must be placed in the general context of the status of prefixes in Russian phonological words.

Consider the following examples cited in Avanesov (1956, p. 43): [kənʲsʲtʲi'tu.ʦɨ.jə] 'constitution,' [kəłdʌ'vatʲ] 'to practice witchcraft.' Beyond all question, the syllabification of these words is *kon.sti.'tu.ci.ja* and *kol.do.'vat'* respectively. The initial syllables are closed, but the vowels in these syllables are reduced to schwa. According to the footing principles proposed by Revithiadou, the second word must be footed as (kəł.dʌ)('vatʲ). On comparing this structure with the proposed footing of (s#ʌ.dvʌ)('ka.təm), we see that the purported status of the syllable [kəł] as the head of a trochaic foot does not prevent the underlying low vowel from reducing to schwa, just like in the alleged foot tail [təm].

The proposal that head and tails of unstressed trochaic feet exhibit considerably different degrees of vowel reduction can also be contested on purely theoretical grounds. Revithiadou and van de Vijver (1997) point out that, whereas the tail of an iambic foot is likely to be considerably shorter than its head, the duration of syllables in trochaic feet is relatively equal. They propose that, in a trochaic foot, an increase in the duration of the head syllable is counterbalanced by an increase in the duration of the foot tail due to its

status as the constituent-final element. Now, if vowel reduction is seen as resulting from a phonetic undershoot caused by shorter duration, then the heads and tails of trochaic feet are expected to exhibit a similar degree of reduction.

The above discussion of factors affecting vowel reduction applies to the mid vowel /e/, too. Revithiadou's claim that the vowel is 'raised to [i]' in closed syllables is illustrated with the examples *bednotá* [bʲid.nʌ.'ta] n 'the poor.' First, it is far from obvious that the syllable containing the correspondent of //e// is indeed closed. Given the Russian preference for onset maximization, the syllabification [bʲi.dnʌ.'ta] is definitely an option. Second, as we have pointed out earlier, the literature we have consulted does not confirm that syllable structure affects the occurrence or degree of vowel reduction in word-internal syllables. The reduction of //e// in *bednotá* is not significantly different from its reduction in *bedolága* [bʲi.dʌ.'ɬa.gʌ] 'luckless person,' although the syllable containing the output correspondent of //e// is undoubtedly open. The neutralization of //e// in unstressed closed and open syllables can provide no evidence as to the metrical status of the respective syllable.

To sum up this discussion of Russian footing, Revithiadou's arguments in favour of exhaustive trochaic footing are insufficient and sometimes based on erroneous or premature generalizations.

1.6.5 Analysis of the accentual patterns of non-derived words

Having pointed out a number of controversies connected with the prosodic well-formedness in Russian, we are ready to return to the discussion of how the model developed in Revithiadou (1999) accounts for the main accentual patterns of Russian. Recall that nouns exhibiting the post-accenting pattern B are analyzed as containing 'unaccentable' roots – roots with a floating accent. A floating accent is not protected by *FLOP, while being forced away from its sponsor by *DOMAIN. Correspondingly, whenever an inflectional ending is present, the accent is realized on the ending. When no surface inflection is present, the accent docks to the rightmost syllable: *gospo'ži* 'madam' Gen. Sg but *go'spož* Gen. Pl. The rightward docking of the accent is enforced by the respective alignment constraint:

(12) Align-R (LA, PrW, R)

Align a lexical accent to the right edge of the prosodic word.

ALIGN-R is ranked below *FLOP: otherwise, all underlyingly associated accents would shift to the rightmost syllable. In the tableau below, output accents are marked with an acute mark (´) over the respective nucleus. Word stress that does not correspond to a lexical accent is marked with the IPA stress symbol ('). The floating accent in the input is denoted by an asterisk (*).

Table 1-8: Generation of *go'spož* 'madam' Gen. Pl. (adapted from Revithiadou, 1999, p. 140)

* gospož	Faith(LA	Align-R	*Domain
☞a. go(spóž)			*
b. (góspož)		*!	*
c. ('gospož)	*!		

In candidate *c*, no violation of ALIGN-R is incurred, because the main stress is not a correspondent of the input floating accent: the input accent has been deleted. This deletion incurs the fatal violation of FAITH(LA). In candidate *b*, the input accent is present in the output but it is misaligned. Candidate *b* and the winning candidate *a* violate *DOMAIN, because the input accent is realized on its sponsoring morpheme. The winning candidate is chosen due to the proper alignment of accent.

A situation where an 'unaccentable' root adds an inflectional ending and the root-sponsored floating accent is realized on the ending involves a split of faithfulness into root faithfulness and inflectional suffix faithfulness. The shifting of accent violates the suffix faithfulness constraint $\text{DEP(LA)}_{\text{INFLS}}$ but satisfies the root faithfulness constraint $\text{FAITH(LA)}_{\text{ROOT}}$.[41] Below we reproduce the respective tableau from Revithiadou (1999); the representational conventions are the same as in Table 1-8 above.

[41] Or, to be more precise, $\text{MAX(LA)}_{\text{ROOT}}$.

Table 1-9: Generation of *gospo'ži* 'madam' Gen. Sg (Revithiadou, 1999, p. 141)

* gospož-, -i	FAITH(LA)$_R$	*DOMAIN	DEP(LA)$_{INFLS}$	FTBIN
☞a. (gospo)(ží)			*	*
b. (góspo)ži		*!		
c. ('gospo)ži	*!			

The violation of root faithfulness by candidate *c* is caused by the deletion of the underlying accent: the word-initial stress has been assigned by default (EDGEMOST-L), and not introduced by an output correspondent of the root accent. In candidate *a*, it is the suffix faithfulness that is violated by the insertion of a correspondent of the root accent. The candidate is chosen as optimal because it satisfies the higher-ranked root faithfulness constraint and *DOMAIN.

The next tableau illustrates the generation of *čeče'vicy*, the genitive singular of the Russian for 'lentil.' This time the root is assumed to have a floating rather than an associated accent. As we have argued above, this input is not harmonic enough to be chosen under Lexicon Optimization. Still, the respective tableau presents an occasion to make some additional points concerning the model under consideration. The asterisk over the input stands for a floating accent.

Table 1-10. Generation of *čeče'vicy* 'lentil' Gen. Sg (based on Revithiadou, 1999, p. 142)

* čečevic-, -y	FAITH(LA)$_R$	HIERAL	ALIGNR	*DOMAIN
☞a. (čeče)(vícy)			*	*
b. (čeče)vi(cý)		*!		
c. če(čévi)cy		*!	**	*
d. (čéče)(vicy)			***!	*

The original tableau in Revithiadou contains candidates *a-c* only; we have added candidate *d* to reveal a weakness in the analysis. The choice between candidates *a* and *d* crucially depends on the gradual interpretation of the alignment constraint ALIGNR. Such an interpretation of this constraint is in disagreement with the current assumption that all

OT constraints are categorical (McCarthy, 2003). The proposed grammar has another, more subtle, weakness. Let us consider a candidate with the main stress on the first syllable: ('čeče)(vicy). Let us further assume that the main stress has been assigned by the EDGEMOST-L default, while the unstressed head of the second foot corresponds to the underlying accent. This assumption is legitimate, if one takes into account that, when defining strong and weak accents, Revithiadou explicitly states that strong accents are realized as foot heads. Given this assumption, an underlying accent can be the head of a foot without being the head of the respective word. This is a serious drawback of the analysis. The source of this problem is that, although strong and weak accents are claimed to be autosegmental features, in the output, they have no phonetic realization without the mediation of some metrical structure. To all intents and purposes, an accent acts as a mere diacritical mark specifying which syllable should be parsed as the head/tail of a foot. As we have just demonstrated, even when there is only one underlying accent, the model under discussion cannot ensure that this accent is chosen as the head of the respective prosodic word.

In all the examples considered so far, the single accent in the input was sponsored by the root. In the next example, *skovorodá* 'frying pan,' the accent is sponsored by the ending, and the root is underlyingly unaccented.

Table 1-11. Generation of a word with an unaccented root and an accented ending (Revithiadou, 1999, p. 143)

skovorod-, -á		FAITH(LA)$_R$	HIERAL	FAITH(LA)$_{INFLS}$	FTBIN
☞a.	(skovo)ro(dá)		*		*
b.	(skovo)(róda)	*!			

The candidate in *b* is excluded by root faithfulness: an accent has been inserted on the root. In this situation, the undesirable prosodic form of candidate *a* does not prevent it from being chosen as the optimal output.

A special claim is made concerning disyllabic endings (e.g. *-ami*) and endings consisting of a closed syllable (e.g. *-ax*). Endings of this structure are always stressed when combined with an unaccented root. Noting that -VCV endings and -VC endings can be analyzed as bimoraic and thus constituting a strict minimal word (SMW), Revithiadou proposes the following constraint:

(13) SUFFIX=SMW>ALIGN-L

If SUFFIX=SMW (A suffix has the size of a SMW), then ALIGN-L (Align a peak at the left edge of the suffix).

As far as we understand, the constraint assigns stress rather than inserts an accent. When ranked below root faithfulness but above suffix faithfulness, the constraint neutralizes accentual contrasts that might be present in the inputs of bimoraic suffixes but allows root accents to surface.

In her analysis of the accentuation of words with no accented morphemes, Revithiadou (1999) follows earlier analyses based on the Basic Accentuation Principle in positing the left-edge default. The constraint enforcing this default is EDGEMOST-L in (9). Being ranked below accent faithfulness constraints, it does not affect the output position of the correspondents of underlying accents. It is this constraint that is also responsible for the putative word-initial secondary stress in polysyllabic words. However, as we have demonstrated above, it is not clear how EDGEMOST-L can be prevented from choosing the location of stress in a word form like *čečevicy* despite its low ranking. Let us examine the generation of its output using the constraint ranking proposed by Revithiadou:

(14) Constraint ranking responsible for Russian accentuation:

TROCHEE, FAITH $(LA)_R$ >> HIERAL >> *FLOP >> ALIGH-R, *DOMAIN >> DEP(LA)INFLS >> FTBIN.

In the tableau below, we have added EDGEMOST-L as the lowest-ranked constraint. We assume that the input association of the underlying accent coincides with its output association, as predicted by Lexicon Optimization. Input and output accents corresponding to word heads are denoted by the acute symbol (´), stress which has been assigned by default is denoted by the IPA symbol ('), while accents that are realized in the output as heads of **unstressed** feet are marked by underlying the respective syllable.[42] The constraint TROCHEE is left out from the tableau with an understanding that iambic feet are disallowed. As all the candidates considered in the tableau consist of two binary feet, we also leave out the constraints FTBIN and HIERAL. None of the candidates violates the

[42] Revithiadou does not consider outputs of this kind.

constraint DEP(LA)$_{INFLS}$, which militates against the insertion of lexical accents on inflectional suffixes; correspondingly, this constrains has also been left out. The constraint ALIGH-R is treated as gradual for the sake of consistency.

Table 1-12: Default stress prevails over an input accent

čečevíc-, -y	FAITH(LA)$_R$	*FLOP	ALIGH-R	*DOMAIN	EDGEMOST-L
a. (čeče)(vícy)			*	*	*!
☞ b. ('čeče)(vicy)[43]			*	*	
c. ('čeče)(vicy)	*!				
e. (ččče)(vicy)		*!	***	*	*

As we see, it is precisely the low-ranked EDGEMOST-L constraint that incorrectly chooses candidate *b* over *a*. An explanation should be given here why candidate *b* does not violate the faithfulness constraint FAITH(LA)$_R$. According to the definition of strong accents provided by Revithiadou, accents are autosegmental features that are realized as foot heads. The candidate in *b* is such that the head of the second foot is in correspondence with the underlying accent. The vocalic peak that constitutes the nucleus of the respective head syllable is the same as the vocalic peak with which the accent is associated in the input. We conclude therefore that the grammar has processed the accent in a fully faithful way. Due to the fact that the grammar enforces exhaustive trochaic parsing and, furthermore, prefers the left word edge as the locus of word prominence, another foot is created and its head is chosen as the head of the prosodic word by EDGEMOST-L. From the point of view of a derivational model, one could say that first, a foot was created whose head had been determined by the accent, and next the remaining fragment of the word was parsed in accordance with the preference for binary trochaic feet. In the case of candidate *c*, the underlying accent has been deleted. The head of the second foot is established on the basis of the exhaustive trochaic footing of the material outside of the head foot determined by EDGEMOST-L. To sum up, the only difference between candidates *b* and *c* consists in the correspondence relation: in candidate *b*, the head of the second foot is in correspondence with the underlying accent, while in candidate *c*, the underlying accent has been deleted. That is why candidate *c* incurs a violation of

[43] While discussing secondary stress in Russian, Revithiadou proposes that the constraint *CLASH prevents the feet which directly neighbour on the head foot from being assigned a secondary stress. This is why no secondary stress is assigned in this case.

FAITH(LA)$_R$, but candidate *b* does not. A different kind of faithfulness relation is violated in candidate *d*: the accent is shifted from the original position within the root to a different position within the root, incurring thereby the fatal violation of the constraint * FLOP.

As we have just seen, the stipulation that underlying accents are realized as heads of feet is not necessarily sufficient for the grammar to correctly assign stress, that is to say, to choose the head foot of a word. It seems that an additional constraint is needed that would prefer the main stress determined by an accent over the main stress determined by default, e.g. 'A strong accent corresponds to the head syllable of the head foot of a given prosodic word.' As it is not our goal to develop the model under discussion, we leave open the question what consequences the introduction of this or similar constraint would have for the model. Let us note, however, that the need for this additional constraint highlights an asymmetry between strong and weak accents. Indeed, the very fact that weak accents are realized as foot tails determines the status of their correspondents within the prosodic word. Foot heads, however, may or may not attract stress.

Now we are ready to consider non-derived words with underlyingly accented endings. As has been mentioned above, only monomoraic inflectional suffixes support accentual contrasts (that is to say, are either accented or unaccented underlyingly). These contrasts are presumably neutralized in bimoraic inflections, which attract stress by virtue of constituting a strict minimum word. When an accented inflectional ending is added to an unaccented root, the input accent is realized on the ending, even if its shift to the root would have resulted in a more well-formed prosodic word. This follows from the fact that well-formedness constraints are ranked below root faithfulness constraints, jointly referred to as FAITH (LA)$_{ROOT}$. An accent sponsored by an inflection, if realized on the root in order to produce an ideal prosodic form, would incur a fatal violation of DEP(LA)$_{ROOT}$. When an accented root adds an accented ending, it is the accent sponsored by the root that surfaces: rabót+á = rabóta. In models based on the Basic Accentuation Principle, this is accounted for by assuming that the grammar chooses the leftmost accent. Revithiadou proposes that this is a consequence of root faithfulness prevailing over inflection faithfulness, and further makes a more general claim. Considering that roots are the morphological heads of non-derived words, the prevalence of root faithfulness over inflection faithfulness constitutes a special case of morphological head faithfulness being ranked over general faithfulness: HEADFAITH >> FAITH. This ranking ensures that an accent sponsored by an inflectional ending or some other suffix which is

not the morphological head of given word can only surface if no accent is sponsored by the morphological head of the word (its root or a category-changing derivational suffix).

Non-derived feminine and neuter nouns exhibit one more interesting pattern. Namely, some feminine nouns conform to the post-accenting pattern in the singular, while in the plural stress is assigned at the right edge of the root: *kolba's-a* 'sausage' Nom. Sg but *kol'basy* Nom. Pl.; neuter nouns would have initial stress in the singular and root-final stress in the plural: *'oz^{j}er-o* 'lake' Nom. Sg but *o'z^{j}or-a* Nom. Pl. In order to account for this phenomenon, Revithiadou posits a co-phonology which is activated in certain morphological contexts. In this co-phonology, stress is preferably assigned to the morphological head, even if the respective morpheme is unaccented or post-accenting. The constraint responsible for this preference is HEADSTRESS:

(15) HEADSTRESS

Morphological heads are stressed.

The role of this constraint is illustrated in the tableau below.

Table 1-13: Generation of *kol'basy* 'sausage', Nom. Pl. (Revithiadou, 1999, p. 236)

* kolbas-, -y	HEADFAITH	HEADSTRESS	ALIGN-R
☞ a. kol(básy)			*
b. (kólba)sy			**!
c. kolba(sý)		*!	

All the candidates realize the underlying floating accent on some syllable, as otherwise they would incur a fatal violation of HEADFAITH (to be more precise, MAX). Candidate *c* fails the HEADSTRESS requirement. The choice between candidates *a* and *b* is made by ALIGN-R, which requires lexical accents to be aligned with the right word edge. Note that the linking of a floating accent to its sponsor is not counted as a violation of any constraint – a new association line is thus assumed to be created 'for free.' In the analysis of tone, the creation of new association lines is seen as a violation of the constraint that militates against new associations, *ASSOCIATE or *LINK (for a list of OT constraints

employed in tone analysis see e.g. Akinlabi & Mutaka, 2001). Note also that the analysis crucially depends on the gradual interpretation of the constraint ALIGN-R.

Table 1-14. Generation of *o'z^{j}ora* (Revithiadou, 1999, p. 237)

ozer-, -á	HEADSTRESS	FAITH(LA)
☞ a. o(z^{j}óra)		*
b. (oze)(rá)[44]	*!	

According to Revithiadou, the accent sponsored by the inflectional ending is realized on the root to satisfy HEADSTRESS: 'this constraint impels the lexical accent of the inflectional ending to be realized on the root' (*ibidem*). As no accent has been deleted or inserted, the violation mark assigned to candidate *a* by FAITH must be due to the violation of *FLOP. Also here, Align-R must be crucially interpreted as gradual to exclude the potentially winning candidate with the input accent realized on the first syllable of the root in agreement with EDGEMOST-L.

1.6.6 Accentuation of derived words

Our work being primarily devoted to the accentuation of non-derived nouns, we shall provide only a brief outline of how the model presented in Revithiadou (1999) accounts for derived words. It has already been mentioned that some derivational suffixes become the morphological heads of the respective derived words, while others do not. In particular, evaluative suffixes do not become morphological heads. As we have demonstrated above, this claim is in need of further investigation, as there are examples of evaluative suffixes that attract stress even if the base to which they are attached is underlyingly accented.

Head suffixes with underlying accents realize their accents irrespective of whether the input contains any other accents: //górl-ást-á// 'loud-mouthed' adj. fem. Nom. Sg surfaces as *gor'lasta*. The accents sponsored by the root and by the ending are deleted, while the accent sponsored by the head suffix is realized. When the head suffix has an underlying floating accent, it is realized on the inflectional ending. Head suffixes with-

[44] In the original, the first two syllables ale left unfooted.

out an underlying accent do not influence the accentuation of the respective derived word.

The accentuation of non-head suffixes is illustrated with the diminutive suffix *-ic* and the augmentative suffix *-išč*. According to Revithiadou, the suffixes are stressed when attached to an unaccented or post-accenting stem; when the base stem is accented, the suffixes remain unstressed. Melvold (1990) analyses these suffixes as recessive accented and states that they only attract stress when attached to an unaccented (pattern C) root. However, all the examples quoted by Melvold in support of this analysis contain either accented (A) or unaccented (C) roots, to the exclusion of post-accenting (B) roots, so the evidence is inconclusive. Recall that she analyses post-accenting roots as a sub-class of accented roots. The prediction of this approach is that words derived from post-accenting roots by means of recessive accented suffixes will be stressed on the root. As both researchers agree that the suffixes in question are never stressed when following an accented (A) root and are always stressed when following an unaccented (C) root, we shall only evaluate the evidence put forward by Revithiadou in support of the claim that the suffixes are stressed when attached to a post-accenting (B) stem.

Revithiadou points out that the augmentative form *temno'tišča* derived from the post-accenting base noun *temno'ta* 'darkness' is stressed on the suffix and generalizes this example to all words derived by means of the augmentative suffix *-išč* from post-accenting stems. In her turn, Melvold cites this particular example as an exception. Both authors consider the stem of the base noun as post-accenting. Indeed, according to Zaliznjak (1977), the base noun is stressed on the endings in the singular and on the last syllable of the stem in the plural: *temno'tu* Acc. Sg but *tem'noty* Acc. Pl.; in terms of Melvold's analysis, the stem is post-accenting with stress retraction in the plural. Is the suffixal stress in the augmentative form *temno'tišča* really exceptional? The question should probably be answered in the negative. In the example *kraso'tišča* derived from *kraso'ta* 'beauty' (post-accenting), the suffix *-išč* again attracts stress. Of course, the structural similarity of the base nouns, i.e. the presence of the suffix *-ot*, does not allow one to refute the supposition that the accentual behaviour of the augmentative forms derived from these bases is exceptional. Here we would like to adduce the augmentative nouns *bi'čišče* and *ko'tišče*, derived from the masculine nouns *bik* 'bull' and *kot* 'cat' correspondingly. The base nouns are non-derived and post-accenting.[45] The suffixal

[45] Their accentuation is checked against Zaliznjak (1977).

stress in the augmentative form indicates that we are not dealing with an exceptional behaviour limited to stems derived with the suffix *-ot*. We conclude that Revithiadou's claim that the augmentative suffix *-išč* is regularly stressed when attached to a post-accenting stem may be well-founded. As far as the diminutive suffix *-ic* is concerned, the example cited by Revithiadou as an illustration of suffixal stress after post-accenting stems (**temno'tica*) must have resulted from a mistake, as no such form can be located either in the dictionaries of Russian that we have consulted or on the Internet. Melvold (1990) does not provide any examples of diminutives formed with this suffix on post-accenting stems. Noting that neither author provides sufficient evidence of the accentual behaviour of this suffix when attached to post-accenting stems, we leave it at that.

Revithiadou proposes that non-head suffixes form 'a bimoraic unit' together with the inflectional ending. It is further stated that 'the basic argument for treating these suffixes as a cluster is that they are never separated by other morphological elements.'[46] These bimoraic clusters are subject to the constraint SUFFIX=SMW > ALIGN- L, which we have already seen in operation when discussing disyllabic suffixes and suffixes consisting of a closed syllable. Such a cluster will attract main stress in the absence of a root accent. If ranked above general faithfulness, it will also prevail over any accents sponsored by inflections. Ranked below head faithfulness, the constraint will only determine the location of stress, if the morphological head (in most cases, the root[47]) is unaccented in the input.

As we have remarked in Footnote 46, the claim that non-head suffixes are never separated from inflectional endings by other morphemes is not quite accurate, because Russian has double diminutives. Another problematic issue with the proposed bimoraic clusters is the existence of disyllabic inflectional suffixes. The instrumental plural form of the diminutive *čast-ic-a* 'small part' is *čast-ic-ami*. The diminutive suffix *-ic* is supposed to form clusters with inflectional endings; in this case the cluster would be (*icami*). Containing three vowels, it obviously cannot be considered bimoraic, and thus does not constitute an SMW (strict minimal word). How is stress established in this case? Is the purported cluster truncated to (*ica*) to the exclusion of the last syllable of the

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[46] The last statement cannot be taken without reservations, as Russian often allows serial diminution: *část*^{j} 'part' – *čast-íc-a* dim. – *čast-íč-k-a* double dim.

[47] As we have pointed out, there are reasons to believe that the stems of nouns like *temnota*, *krasota*, etc. are derived, so in their case head faithfulness would probably refer to the head suffix *-ot* rather than the root.

ending e.g. due to extrametricality? Furthermore, when discussing the application of the constraint SUFFIX=SMW > ALIGN-L to inflectional endings, Revithiadou explicitly states that -VC endings are considered bimoraic. Now the instrumental singular form *časticej* also becomes problematic. True, the ending *-ej* is monosyllabic, but its syllable is closed, which means that the cluster (*icej*) has three moras, and not two. In this case, truncation of the last syllable is not an option. We conclude that the proposal to treat non-head suffixes as constituting bimoraic clusters together with inflectional endings is not viable.

Revithiadou isolates another group of derivational suffixes. The head suffixes *-ost'*, *-nik* and *-stv-* are remarkable in that nouns derived by their means are always stressed on the base, even if the base contains a post-accenting root. The proposal is that these suffixes 'fall outside the domain of the prosodic word and behave like clitics.' Evidence for their clitic nature is drawn from the facts pertaining to yer vocalization. The claim is that one of the environments for the vocalization of yers is 'the end of the prosodic word,' as shown by *kuk<u>o</u>l* 'doll' Gen. Pl. as opposed to *kukla* Nom. Sg. Correspondingly, the vocalization of the yer in the derived word *kukol^{j}nik* is interpreted as an indication of the extraprosodic nature of the suffix. Now, the common analysis of the vocalization of yers is that they are vocalized either for syllabification reasons or before another yer (see e.g. Rubach, 1993; Szpyra, 1992). Under the first approach, the relevant factor would be that a failure of the underlying yer to vocalize in *kukol* would result in a non-optimal coda *-kl*. Under the second approach, the genitive plural ending is assumed to be a back yer underlyingly. Being an ending, this yer is never followed by another yer, and thus fails to vocalize. Its presence is stipulated on the basis of evidence such as the vocalization of root yers preceding this ending. Now, there are reasons to believe that the suffix *-nik* actually has a front yer as its first underlying element: it is this yer vowel that causes first velar palatalization in e.g. *moločnik* 'milkman' (cf. *moloko* 'milk'). As we see, the suggestion that yer vocalization before the suffix *-nik* may be indicative of a prosodic boundary is problematic. Note also that derived nouns formed by means of this group of suffixes add inflectional endings like any other declinable noun. In terms of syllable structure, a suffix like *-ost^{j}* would spread over two syllables in an inflected form of the derived word. The first syllable would consist of an onset submitted by the base and the vocalic part of the suffix, and the second syllable would consist of the consonantal part of the suffix plus the rhyme submitted by an inflectional ending. Are endings also excluded from the prosodic word? Do they form a separate prosodic word either on their own or together with the suffix? Are there any non-head suffixes that are extraprosodic?

Noting the weakness of the non-accentual evidence in favour of the existence of extra-prosodic suffixes, we suggest that the exceptional accentual behaviour of these head suffixes needs further investigation.

1.6.7 Summary

Let us recapitulate the main aspects of the model of Russian accentuation presented in Revithiadou (1999). The analysis is based on the postulate that morphological structure is directly reflected in the prosodic structure. Head faithfulness (where the term 'head' denotes a morphological head) is ranked over general faithfulness. When the constituent morphemes of a word do not contain underlying accents, stress is assigned at the left word edge in compliance with EDGEMOST-L. If the root of a non-derived word is accented, its accent prevails over the accentual characteristics of inflectional endings thanks to the high-ranked HEADFAITH constraint. In native roots, accents that are associated to a peak in the input can be shifted, if so required by prosodic well-formedness requirements. The well-formedness constraint HIERAL is ranked above the constraint *FLOP, which bans shifts of associated autosegments. In the case of borrowings, HIERAL is ranked below *FLOP, so that underlying accents are parsed in a fully faithful manner: they are neither deleted nor shifted. Floating accents sponsored by roots are realized on inflectional endings thanks to the gradual alignment constraint ALIGN-R, which requires accents to be aligned with the right edge of a prosodic word. A special constraint requires that word stress be assigned to the first syllable of a bimoraic inflectional ending. The same constraint applies to evaluative (non-head) derivational suffixes, which are analyzed as constituting a bimoraic cluster together with inflectional endings. When the morphological head of a word is an accented derivational suffix, the accent sponsored by the suffix will prevail over any accents that might be sponsored by the remaining morphemes, including the root.

The proposal that accents should be construed as autosegmental features which can be either associated or floating in the input is one of the most interesting elements of the analysis. We have argued, however, that, given the author's proposal that footing in Russian is exhaustive, the stipulation that a strong accent is realized as the head of a foot may not always be sufficient to ensure that the main stress is assigned to this 'accented' foot rather than to the leftmost syllable of the word. A separate constraint that would choose the location of the main stress determined by an underlying accent over the

default location seems to be necessary. Notably, the author claims that accents can also be used to account for pitch-accent systems. In pitch-accent systems, the autosegmental feature 'accent' is realized as either high pitch (strong accents) or low pitch (weak accents). In Russian, however, the same feature is but a mere placeholder for foot structure, very much like the 'asterisks' used to mark the docking places of tone. In much of current analysis of tone, asterisks have come into disuse due to the assumption that tone can be either floating or pre-associated in the input. It is unsettling that the tone-like input feature employed by Revithiadou (1999) for the analysis of free stress, for all intents and purposed, surfaces as an asterisk marking the head/tail of a foot. Moreover, the nature and perhaps the very existence of foot structure in Russian is debatable. Evidence cited in support of either trochaic or iambic footing is inconclusive. Successful analyses of the accentual system of Russian have been performed under the opposite assumptions about the foot type, as the Russian foot has been variously analyzed as iambic, trochaic, binary, or unbounded. The idea that prosodic well-formedness plays a role in the surface realization of underlying accents, expressed in the constraint HIERAL, apparently creates more problems in the analysis of Russian than it solves. While successfully accounting for the marginal issue of the lack of native trisyllabic roots with fixed stress on the second syllable, it incorrectly predicts stress shifts in forms with disyllabic inflectional endings. The proposal that every non-head suffix forms a bimoraic cluster with the ensuing inflectional ending and that this cluster is treated as a stress-attracting Strict Minimal Word also fails in the case of disyllabic/bimoraic endings.

The proposal concerning the mapping of morphological hierarchy to prosodic hierarchy put forward in Revithiadou (1999) is intellectually very attractive. The idea that head suffixes, which determine e.g. the syntactic category of a given derived word, are preferred as prosodic heads is definitely worthy of further investigation. It is especially interesting in the light of the claim put forward in Zaliznjak (1985) that Common Slavic had no dominant suffixes,[48] while modern East Slavic languages exhibit a tendency towards the expansion of suffix dominance. However, we have cited examples of evaluative (non-head) suffixes whose accents prevail over the accents sponsored by roots/stems. One possibility is that these suffixes are exceptionally treated as morpho-

[48] In many cases, the notion of a dominant suffix as used in Melvold (1990) coincides with Revithiadou's notion of a head suffix. Although, as pointed out by Alderete (1999), a dominant suffix may or may not be a morphological head in terms of Revithiadou's analysis, the two sets of suffixes overlap to a very considerable degree.

logical heads in the hierarchic structure of the respective derived words. The alternative analysis to be considered is that the relationship between morphological structure and prosodic structure is not quite as straightforward as suggested by Revithiadou. Still, the proposal that morphological heads may play a special role in accentuation is a promising line in the investigation of the accentual properties of derived words in free-stress systems.

1.7 Stem-final default: experimental data and OT analysis in Crosswhite *et al.* (2003)

1.7.1 Stem-final stress default and its analysis

Crosswhite *et al*. (2003) present the results of an experiment in which they studied the accentuation of nonce words by speakers of Russian. According to these results, 'speakers stressed the last syllable of the stem, i.e., the ultima in words without inflections, and the antepenult or penult in words with inflections (depending on length of the inflection).' This result is compatible with that presented in Nikolaeva (1971) and, more recently, in D'jačok (2002): forms that end in a consonant are predominantly stressed on the final syllable, while forms that end in a vowel are predominantly stressed on the penultimate syllable. The fact that we are not dealing with a moraic trochee system with moraic coda consonants is revealed by nonce forms with an identifiable disyllabic inflection: such forms receive antepenultimate stress. If the word-final string can be identified as a monosyllabic inflection, stress is assigned to the penult, irrespective of whether the final syllable is open or closed.

On the basis of the experimental data, the authors formulate the following OT constraint, which formally expresses the stem-final stress default demonstrated in the experiment:

(16) ALIGNRIGHT: The right edge of the stem coincides with the right edge of some foot.

When discussing other works, we have seen that the underlying accentual properties of Russian morphemes were variously represented as diacritics, brackets or autosegmen-

tal features. Crosswhite *et al*. (2003) propose that inputs may specify foot heads and foot tails. Below we reproduce the table of some of the possible inputs of disyllabic stems.

Table 1-15: Inputs and outputs of disyllabic stems (Crosswhite, et al., 2003, p. 161)

	Input stem	Inflected output	Position of stress
a.	(ó) o	(ó) o + o	Initial
b.	(o ó)	(o ó) + o	Stem-final
c.	o (o ´)	o (o + ó)	Ending
d.	o o	(o ó) + o	Stem-final

The representations account for two accentual patterns: in the first one, stress is fixed on either the first or the second syllable of the stem (pattern A); in the second one, stress is fixed on the ending (the post-accenting pattern B). Unfortunately, the article contains little comment on the exact nature of the input representations. Thus, one would like to know whether the presence of foot structure in the input presupposes the presence of syllable structure. Given the general predictability of syllabification, the presence of syllable structure in inputs would mean massive redundancy.

Underlyingly specified foot heads and tails are outputted as surface foot heads/tails thanks to the faithfulness constraint in (17):

(17) L/R-FOOTANCHOR: The left/right edge of every foot in the input corresponds to the left/right edge of some foot in the output.

The authors propose the following ranking of other well-formedness constraints for Russian:

a) FOOT=IAMB >> FOOT=TROCHEE: iambic feet;
b) R-FOOTANCHOR >> FOOTBINARITY: non-binary feet (this ranking ensures the well-formedness of monosyllabic feet in e.g. monosyllabic words or words in which the first syllable is prespecified as a foot head);
c) L/R-FOOTANCHOR >> PARSESYLLABLE: non-iterative stress (there is no secondary stress in non-compounds);
d) L/R- FOOTANCHOR >> ALIGNRIGHT: free stress (underlying specification prevails over the stem-final default).

It is the ALIGNRIGHT constraint that ensures that forms with no underlyingly specified head or tail, such as nonce words, are assigned stress at the right edge of the stem. Note that the authors assume that inflectional endings have no underlying metrical specifications (are not accented): ranked below L/R- FOOTANCHOR, the default-enforcing alignment constraint would not be able to prevail over underlying specifications.

1.7.2 Analysis of mobile patterns of stress

ALIGNRIGHT also plays a role in the analysis of mobile stress patterns. In the mobile pattern D, stress is placed on inflectional endings in the singular, but it is stem-final in the plural: *kolbas+á* 'sausage' Nom. Sg as opposed to *kolbás+ami* Instr. Pl. The authors propose that this pattern results from anti-faithfulness requirements. Anti-faithfulness constraints, developed in Alderete (1999 [2001]), require a phonological change in the output of some morphological process as compared to the base of the process. The application of anti-faithfulness is lexeme-specific, as only some stems are 'specified for a mobile stress correspondence' (Crosswhite, et al., 2003, p. 162). Anti-faithfulness, if ranked higher than the respective output-output faithfulness constraints, 'produces the desired shifts in stress.' Below we reproduce the respective OT tableau.

Table 1-16: Emergence of stem-final default (after Crosswhite, et al., 2003)

Base		Output	ANTIFAITH	OO-IDENT	ALIGNRIGHT
a.	oo-ó SG	o(o–ó) PL	*!		*
b. ☞	oo-ó SG	(oó)–o PL		*	
c.	oo-ó SG	(ó)o–o PL		*	*!

In the tableau, singular forms are taken to be the base for plural outputs. While anti-faithfulness requires that word stress be shifted to the stem, ALINGNRIGHT chooses the location to which stress is shifted. OO-IDENT[49] assigns violation marks both to the plural form stressed on the second syllable of the stem and to that with stem-initial stress. The tie is resolved by ALINGNRIGHT.

[49] OO-IDENT assigns violation marks for the 'deletion' and 'insertion' of stress.

Recall that ALIGNRIGHT requires the right edge of the stem to coincide with the right edge of some foot. Let us see whether this requirement is indeed fulfilled in the case at hand. As the syllabification of the nominative plural form *(kol.bá.)sɨ* shows, the rightmost segment of the stem *kolbas-* is part of the syllable *.sɨ*, which lies outside the binary iambic foot. In other words, the right edge of the stem in fact **does not coincide** with the right edge of a foot – the last segment of the stem is syllabified as the onset of the syllable which follows the only foot in this word. It appears that ALIGNRIGHT should be defined in terms of the position of the right edge of a foot with respect to the rightmost nucleus of the stem: it is the right edge of the syllable containing the rightmost nucleus of the stem that should be aligned with the right edge of some foot. The fact that no violation mark is assigned to the chosen output by ALIGNRIGHT in the tableau means that the authors interpret the constraint in a similar fashion, in disagreement with its explicit formulation. Because Russian stems are generally consonant-final, while inflectional endings are all vowel-initial, the reservation concerning the mismatch between the right stem boundary and the right foot boundary applies to virtually all inflected word forms.

There is another potentially problematic issue pertaining to the right boundary of the stem. The authors of the article under discussion follow Alderete (1999) [2001] in assuming that the domain of application of OO-correspondence constraints is **the shared stem**. Most of the times, the right boundary of the shared stem coincides with the right boundary of the shared segmental string, so its boundaries can be determined by examining the respective output forms. For example, if we compare the output of the instrumental singular form *kolbasu* to the output of the instrumental plural form *kolbasami*, we see that the shared string coincides with the morphological stem *kolbas-*. However, there is nothing in Alderete's proposal that would prevent e.g. the Nom. Sg form *kolbasa* from being the OO base of the Instr. Pl. form *kolbasami*, because the only criterion used to establish the base is markedness: the singular is less marked than the plural, and therefore the singular is chosen as the OO base of the plural. In principle, any singular form of a given noun can be taken as the base of any plural form of the same noun.[50] If the nominative singular form *kolbasá* is taken to be the base of the instrumental plural form *kolbásami*, then the shared segmental string [kolbasa] does not coincide

[50] Unless, of course, the nominative singular is seen as less marked than, say, the instrumental singular. In this case, the criterion of markedness means that the nominative singular form of a given noun will be chosen as the base.

with the shared morphological stem [kolbas]. It appears that the proviso that output-output correspondence constraints apply within the shared stem cannot be enforced, unless we assume that morpheme boundaries are visible to OO constraints. Obviously, such boundaries are not present in outputs, so in order to determine the proper domain of application of OO constraints one has to examine the inputs or the entire paradigm. Let us consider a situation in which OO-identity constraints apply to the entire shared segmental string *kolbasa* rather than to the morphological stem *kolbas-*. A stress shift within the shared string will result in two violations of OO-IDENT: one at the original locus of stress, and another one at the new locus.[51] Correspondingly, ANTIFAITH will incorrectly shift stress from this shared string to the only vowel which is not shared, that is the final vowel.

Table 1-17: Choice of the wrong optimal candidate if OO constraints apply to the entire shared string

Base		Output	ANTIFAITH	OO-IDENT	ALIGNRIGHT
a.	kolbasá $_{SG}$	kol(basá)mi $_{PL}$	*!		*
b.	kolbasá $_{SG}$	(kolbá)sami $_{PL}$		**!	
c.	kolbasá $_{SG}$	(kól)basami $_{PL}$		**!	*
d. ☞💣	kolbasá $_{SG}$	kolba(samí) $_{PL}$		*	*

In the other mobile pattern, stress is fixed on the stem in the singular and on the inflection in the plural: *kólokol-a* 'bell', n, Gen. Sg but *kolokol-ámi* Nom. Pl. The tableau generating this pattern is reproduced below:

Table 1-18: Generation of the second mobile pattern (Crosswhite, et al., 2003, p. 163)

Base		Output	ANTIFAITH	OO-IDENT	ALIGNRIGHT
a.	óo-o $_{SG}$	(ó)o–oo $_{PL}$	*!		*
b.	óo-o $_{SG}$	(oó)–oo $_{PL}$		**!	
c. ☞	óo-o $_{SG}$	o(o–ó)o $_{PL}$		*	*
d.	óo-o $_{SG}$	oo–(oó) $_{PL}$		*	**!

[51] At least, this is how we understand the following statement made in the article: 'Shifting stress from the initial to the end of the stem (…) involves two violations of Faithfulness for stress, OO-IDENT.' An expansion on this topic follows presently.

Candidate *a* is excluded by prosodic anti-faithfulness. OO-IDENT excludes candidate *b* by assigning two violation marks for a stress shift within the shared stem: one for stress deletion and another for stress insertion. The choice between candidates *c* and *d* is made by ALIGNRIGHT: stress on the first vowel of a disyllabic inflectional ending is preferred because it is one syllable away from the right edge of the stem, whereas stress on the second vowel of the inflection is two syllables away from the right edge of the stem. As we see, ALIGNRIGHT is crucially gradual in this analysis. Note also that the shared string [kolokola] does not coincide with the morphological stem [kolokol]. OO-IDENT constraints assign only one violation mark to candidate *c*, which means that their domain of application is the stem, so the insertion of stress on the ending does not incur an OO identity violation. As we have already argued, it is not clear how OO constraints can be 'informed' that the shared stem is different from the shared segmental string [kolokola].

The authors do not specify what constraints are gathered under the label 'OO-IDENT.' The fact that the constraints assign two violation marks for a stress shift within the shared stem seems to indicate that this shift is interpreted as involving the deletion and insertion of stress. However, a shift could result from a simple movement of whatever is assumed to represent stress. Alderete (1999) employs a faithfulness constraint against the movement of stress: NOFLOP. If used in output-output correspondence, this constraint would require stress to remain at the same location in the derived output as in the base. An output candidate resulting from a shift of 'the same' stress rather than the deletion of stress at one place and its insertion in another would be identical with candidate *b* in the above tableau – the only difference would be in output-output correspondence relations. This candidate would involve one violation of OO-NOFLOP and, correspondingly, one violation of OO-IDENT. It is this candidate that would be wrongly chosen by the grammar as the optimal one.

It should be emphasized here that the phonological analysis of Russian accentuation constitutes only a small part of the article, whose bulk is devoted to an experimental study of the accentuation of nonce words by speakers of Russian. While remaining sceptical of the applicability of output-output correspondence to word forms that are not related derivationally, we fully sympathize with the authors' attempt to reconcile a phonological analysis of Russian accentuation with the empirical evidence pertaining to the default accentuation of nonce words.

1.8 Analysis of the accentuation of compounds in Gouskova (2010): are there two stress defaults in Russian?

So far, we have discussed works that variously assumed word-initial, post-stem, and stem-final stress defaults for Russian. In an analysis of Russian compound stress, Gouskova (2010) proposes that there are ***two*** stress defaults in Russian: 'prosodic-word-initial and prosodic-word-final,' and that 'each holds of a relatively small subset of morphemes.'

Compounds are the only words in Russian that may have a secondary stress. The main stress is always assigned to the right stem of a compound, while a secondary stress, if any, may be assigned to the left stem. According to Gouskova, the presence of a secondary stress on the first stem of a two-stem compound depends, among other factors, on the underlying accentual properties of the first stem. Namely, A-stems attract secondary stress, while B and C-stems generally do not. The left stem of *veroispov-edanie* 'religious denomination' consists of the bare root *ver-*, which forms the noun *vera* 'belief' and belongs to accentual class A. Correspondingly, the left stem of the compound receives secondary stress: *ˌveroispoˈvedanie*[52]. The root *golov-*, which forms the noun *golova* 'head' belongs to accentual class C, so the compound *golovoˈlomka* 'puzzle' lacks secondary stress. In *korablestroˈenie* 'shipbuilding,' the first stem is *korabl-*, which belongs to the post-accenting class B; correspondingly, no secondary stress is assigned.[53]

This behaviour is unexpected under most of the existing analyses. Recall that Melvold (1990) treats post-accenting (class B) roots as a sub-class of accented roots. According to her, the last vowel of a post-accenting root is accented, and the shift of stress from that vowel to the inflexion is achieved thanks to the operation of a special rule. Under the analysis of post-accentuation in Alderete (1999), post-accenting roots are unaccented. On the other hand, Alderete's analysis predicts that post-accenting (class B) roots cannot pattern together with C-roots, for the latter have to be analyzed as accented in his model. To sum up, the analysis in Melvold predicts that A-roots will pattern

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[52] In Gouskova (2010), this word is given with a different main stress: *ˌveroispoveˈdanie*. Rozental' and Telenkova (1984) specifically warn against this accentuation as non-standard. We cite this word in the recommended standard form *ˌveroispoˈvedanie* checked with Zaliznjak (1977).

[53] Examples of compounds are adapted from Gouskova (2010).

together with B-roots, as far as their ability to attract secondary stress is concerned, and the analysis in Alderete predicts that A-roots will pattern together with C-roots. Neither prediction is compatible with Gouskova's (*op. cit.*) observation that accented (class A) roots stand apart from the other types of roots in that they alone attract secondary stress.

Gouskova's analysis is that both B and C-stems are underlyingly unaccented. According to her, the post-accenting pattern B results from the operation of a lexically-indexed alignment constraint:

(18) ALIGN-R(PWD, HEAD)$_B$: 'The right edge of a PWd coincides with the right edge of the Head of the PWd.' [Indexed to Pattern B roots]

Pattern B roots are analyzed as underlyingly unaccented; therefore, the lexically indexed right-edge default can apply. The default predicts that non-derived words with such roots will be stressed on the final syllable of the respective word form. The prediction is correct for all the case/number forms except for those with the disyllabic instrumental plural ending *-ami*: *'bɨk* 'bull' Nom. Sg, *bɨ'ka* Gen. Sg, *bɨ'ki* Nom. Pl but, unexpectedly, *bɨ'kami* Instr. Pl. rather than **bɨka'mi*. Recognizing this problem, Gouskova proposes that the failure of instrumental plural forms to be stressed word-finally can be explained by a morpheme-specific ranking of NONFINALITY. We shall return to this issue presently.

The word-initial stress default is used to account for the accentual Pattern C. Recall that in this pattern stress alternates between the word-initial position and the inflection. The roots of the respective words are also assumed to be unaccented, but they are subject to a different alignment constraint:

(19) ALIGN-L(PWD, HEAD): 'The left edge of a PWd coincides with the left edge of the Head of the PWd.'

This second default is not lexically indexed and is assumed to be 'the phonological default in the language as a whole.' If ranked below the ALIGH-R constraint in (18), the constraint in (19) will enforce word-initial stress on underlyingly unaccented strings whose roots are not subject to the indexed constraint ALIGN-R$_B$. It is not clear, however, why the left-edge default is designated as active 'in the languages as a whole' rather than the right-edge default.

Let us return to the role of NONFINALITY in assigning penultimate stress in noun forms composed of a B-root and the disyllabic instrumental plural ending *-ami*. Gouskova's assumption is that NONFINALITY is ranked in a morpheme-specific manner in the case of this disyllabic ending, presumably above the indexed alignment constraint ALIGN-R_B in (18). Under ALIGN-R_B, the head of a PrWd must be word-final, while NONFINALITY states that the head of a prosodic word cannot be final (Prince & Smolensky, 1993). If ranked above ALIGN-R_B, the morpheme-specific NONFINALITY will prevent stress from being assigned to the second vowel of the ending *-ami*. The choice between word-initial and penultimate stress is made by ALIGN-R_B, which crucially must be interpreted as gradual. If the constraint is categorical, then all the candidates with non-final stress will tie on this constraint, and the lower-ranked ALIGN-L will incorrectly choose the candidate with word-initial stress as optimal.

Even if ALIGN-R_B is construed as gradual, the morpheme-specific ranking of NONFINALITY is questionable. The instrumental singular ending of feminine nouns *-oj* has an extended, disyllabic version *-oju*. When added to a B-stem, the ending is stressed on the first (or the only) vowel: *ba'škoj* 'head' colloq., Instr. Sg or *ba'škoju*. Given Gouskova's analysis of the accentual pattern B, stress must be assigned to the last syllable of the word (due to the operation of ALIGN-R_B). In order to account for the actual location of stress, NONFINALITY again must be ranked in a morpheme-specific manner. This, of course, is only possible, if *-oj* and its variant *-oju* are assumed to be two different morphemes or if morpheme-specific ranking is reformulated as allomorph-specific ranking. Indeed, if the ranking of NONFINALITY above ALIGN-R_B is specific to the instrumental singular ending *-oj/oju*, then ALIGN-L will enforce word-initial stress: *'baškoj*. The analysis can be saved by postulating that this ranking of NONFINALITY is specific to the disyllabic *-oju* but not to the monosyllabic *-oj*. If one takes into account the fact that all disyllabic endings of Russian nouns and adjectives (including the extended variants of monosyllabic endings) are stressed on the first syllable, then a morpheme-specific or allomorph-specific solution becomes even less convincing.

Reservations concerning the feasibility of the analysis notwithstanding, the article is a significant contribution to the discussion of East Slavic stress, as it investigates the largely overlooked subject of the accentuation and prosodic structure of compounds. Gouskova presents independent evidence in favour of treating Russian compounds as single prosodic words; another interesting result is that linker vowels in Russian compounds are inserted by morphology rather than through a phonological epenthesis. If

correct, her observations concerning the distribution of secondary stress in compounds should be taken into account by researchers working on Russian accentuation.

1.9 Concluding remarks on the representation of accentual properties

In this concluding section of our review of the existing literature, we would like to focus on the issue of the representation of accentual properties of Russian morphemes. Different analyses employ a wide array of input representations – from diacritic marking through underlying metrical structure to autosegmental features. The autosegmental approach is adopted in two works written in the OT framework: Alderete (1999) and Revithiadou (1999). Both authors set out to develop models that can be used to analyze free-stress systems (e.g. Russian) as well as pitch-accent ones (e.g. Japanese). In the former work, the accentual feature is realized as a Line 1 asterisk in the metrical grid. The assumption seems to be that the ictus of word prominence is determined on the basis of metrical structure both in stress languages and in pitch-accent languages. However, as Hyman (2006) remarks, all pitch-accent systems can be adequately analyzed in purely tonal terms. Current studies of tone generally do not employ asterisks to mark the location of tone association in the input; instead, tone may be represented as underlyingly pre-linked to a particular tone-bearing unit. In her turn, Revithiadou (*op. cit.*) proposes that the autosegmental accentual feature is tone-like. The feature can have two values: strong and weak. A strong accent is realized as a foot head in stress systems and as high pitch in pitch-accent systems. A weak accent is realized as a foot tail or low pitch correspondingly. The proposal seems to be either that the accentual feature is superordinate with respect to tone or that phonetics can directly interpret the accentual feature as pitch. One may wonder, however, if this is not a case of an unnecessary multiplication of entities. The most obvious choice of a *tone-like a*utosegmental feature that can be realized as pitch is just tone. This simplified assumption concerning the nature of the representation of accentual properties restricts possible analyses to the constraints/processes that are already known from the study of tone.

In subsequent chapters, we develop the autosegmental approach to free stress under the assumption that the properties of the accentual feature are identical with those of tone, the more advanced version of the assumption being that the feature is nothing else but tone. Following Revithiadou (1999), we posit that the input of a morpheme can

contain at most one instance of the accentual feature, either pre-linked or floating.[54] As we have pointed out in our review, the linking of tone in Revithiadou's analysis is achieved 'for free' in the sense that no constraint is violated by the creation of a new association line. It is worth pointing out that constraints against the creation or deletion of association lines are standard in OT studies on tone. They are variously referred to as *ASSOCIATE, *DISASSOCIATE, *LINK, *DELINK, etc. In our analysis, we propose that association lines present in the input can only be deleted in order to satisfy the culminativity requirement. The choice between two or more instances of pre-linked input tone is made by the grammar. The creation of a new association line between tone and the respective tone-bearing unit is only allowed if no pre-linked tone is present in the input. If an input contains two or more instances of floating tone, only one of them gets associated, the choice being made by the grammar. As we shall demonstrate, the application of constraints against the creation and deletion of association lines to the analysis of Belarusian stress results in a surprisingly simple account which does not require any extensions of OT and sheds a new light on the phenomenon of accentual dominance.

[54] For a recent argument against pre-linked tone in inputs see McCarthy, Mullin, & Smith (to appear).

2. The accentuation of non-derived nouns in Belarusian

2.1 Introduction

Most of the existing generativist work on the accentuation of East Slavic has focused on Russian, leaving Ukrainian and Belarusian, the other two East Slavic languages, aside. One of the few exceptions is the OT account of the accentuation of Ukrainian nouns presented in Butska (2002). Belarusian stress, despite some interesting differences from both Russian and Ukrainian, has never been analyzed so far, although Stankiewicz (1993) made the relevant data available to researchers who do not read in Slavic languages.

We begin this chapter with a fairly detailed description of the accentual patterns of Belarusian non-derived nouns and a discussion of accentual variation. Next, we outline a tonal analysis of the accentuation of non-derived nouns and consider its implications for the study of derived words. In the final section, we consider the relationship between representational markedness and the prevalence of particular stress patterns. Recall that under Melvold's (1990) analysis, roots without accentual marking correspond to the mobile pattern C, in which word-initial stress alternates with inflectional stress. However, in terms of prevalence, this pattern is quite marginal, which would mean that marked (accented) roots greatly outnumber unmarked roots. Moreover, data from the accentuation of nonce words and borrowings seem to be incompatible with the assumption that unmarked roots follow the mobile pattern. A brief discussion of this problem and its implications for tonal analysis conclude the present chapter. In the following chapter, we discuss the phonetic cuing of word prominence in Belarusian, neutralization of unstressed vowels, and the special status of the immediately pretonic syllable.

2.2 The accentual patterns of non-derived nouns

2.2.1 Preliminary remarks

Let us begin with some general information on Belarusian stress. The Belarusian language belongs to the category of 'free stress' languages, in which the location of stress

cannot be determined on the basis of the syllable structure or phonetic properties of the surface form of a given word. It is thus opposed to languages with metrically determined surface-predictable stress like Polish (penultimate stress), Macedonian (antepenultimate stress),[1] Latin (weight-sensitive stress at the right edge), *etc.* The location of stress can contrast lexical items or different forms of the same item: *'kara* 'punishment' versus *ka'ra* 'bark of a tree'; *'ruki 'hand'* Nom. Pl. versus *ru'ki* Gen. Sg.

As we shall primarily discuss the accentuation of nouns, some basic facts about this lexical class will be helpful. Belarusian nouns can belong to the masculine, feminine, or neuter gender. They are used in the singular or in the plural number. Nouns in Belarusian are declined by case. Case and number are fused in declensional endings. For example, the ending /-ы/ marks the genitive case of the singular number of feminine nouns. There are seven cases: nominative, genitive, accusative, dative, instrumental, locative, and vocative. In dialects, both masculine and feminine nouns may have vocative singular forms that are distinct from the nominative. In Standard Belarusian, the use of distinct vocative forms is limited to the singular number of some frequently used masculine nouns. Correspondingly, in their works on nominal accentuation, both Loban (1957) and Biryla (1986) disregard the vocative case. In the subsequent discussion, we adopt the same policy.[2]

For the purposes of accentuation studies, it is convenient to divide nouns into derived and non-derived. In most derived nouns, stress is fixed on one of the stem vowels. Some derived nouns are post-accenting: if there is an overt ending, stress falls on the ending; in the absence of any overt ending, stress falls on the last syllable of the stem. Thus, derived nouns are characterized by columnar stress. As far as non-derived nouns are concerned, the picture is more intricate. In the majority of non-derived nouns, stress is fixed on the stem or on the ending, just like in derived nouns. However, a considerable number of non-derived nouns exhibits stress mobility, as will be demonstrated presently.

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[1] Systems like Polish or Macedonian are sometimes referred to as 'fixed stress' systems (e. g. in Baerman 1999). In our discussion of Belarusian, we often use the term 'fixed stress' to denote a situation where stress remains on the same syllable throughout the declension.

2 Most of the distinct vocative forms that we have collected are stressed on the same syllable as the respective nominative form, irrespective of the accentual class of a particular noun. Crucially, this is also true of post-accenting nouns. Compare: *ɣaspada'ra* ('master', Gen. Sg), *ɣaspada'ru* (Dat. Sg), *ɣaspada'row* (Gen. Pl.) but *ɣaspa'daru* (Voc. Sg), *ɣaspa'dar* (Nom. Sg). Vocative forms have been characterized by exceptional accentuation in many IE languages.

2.2.2 Immobile root stress

We begin with those non-derived nouns in which stress is fixed on the root. Following the tradition established in the literature, we refer to this accentual pattern as class/group/pattern A. The pattern is prevalent in all the genders and declension types. In our presentation, declension types are referred to as o-stem (masculine and neuter nouns), a-stem (mostly feminine, with the nominative singular ending *-a*), and i-stem (feminine, without an overt nominative singular ending).[3] In the tables below, whenever more than one form is acceptable, the variants are separated by a slash (/). If the forms are in free variation, no further comment is made. If a variation follows from the difference between Unreformed Standard Belarusian and Reformed Standard Belarusian,[4] the form used in the Unreformed Standard is marked with an asterisk (*) at the right edge: *sta'ɫom**. Optional vocalic extensions of endings are placed in parenthesis: *-aj(u)*. Letters 'e' and 'o' are used instead of the IPA symbols for the mid vowels /ɛ/ and /ɔ/.

Table 2-1: Accentuation of o-stem Class A nouns

	Masculine		**Neuter**	
Case	**Singular**	**Plural**	**Singular**	**Plural**
Nominative	'žax	'žax^{j}-i	'słoʊ-a	'słoʊ-ɨ
Genitive	'žax-u	'žax-aw	'słoʊ-a	'słow / 'słoʊ-aw
Dative	'žax-u	'žax-am	'słoʊ-u	'słoʊ-am
Accusative	'žax	'žax^{j}-i	'słoʊ-a	'słoʊ-ɨ
Instrumental	'žax-am	'žax-am^{j}i	'słoʊ-am	'słoʊ-am^{j}i
Locative	'žax-u	'žax-ax	'słoʊ^{j}-e	'słoʊ-ax
Gloss	*(feeling of) horror*		*word*	

[3] We use the labels simply as a convenient notation of declension types, without reference to the diachronic development of any given word.

[4] The nomenclature is introduced in Wexler (1977). Reformed Standard Belarusian is the official standard in the Republic of Belarus, which dates back to the language reform introduced by a decree of the Communist government in 1933. Most users of Standard Belarusian living in the free world did not embrace the reform, and have been using a slightly modified version of Unreformed Standard Belarusian. Starting from late 1980s, Unreformed Belarusian has been used in the Republic of Belarus itself by a number of periodicals and authors. For more detail on the two standards, see Wexler (1977).

Table 2-2: Accentuation of feminine Class A nouns

	a-stem		i-stem	
Case	**Singular**	**Plural**	**Singular**	**Plural**
Nominative	'bab-a	'bab-ɨ	'sol^{j}	'sol^{j}-i
Genitive	'bab-ɨ	'bap[5] / bab-aw	'sol^{j}-i	'sol^{j}-ej / 'solj-aw
Dative	'bab^{j}-e	'bab-am	'sol^{j}-i	'sol^{j}-am
Accusative	'bab-u	'bap	'sol^{j}	'sol^{j}-i
Instrumental	'bab-aj(u)	'bab-am^{j}i	'sol^{j}:-u / 'sol^{j}-aj(u)	'sol^{j}-am^{j}i
Locative	'bab^{j}-e	'bab-ax	'sol^{j}-i	'sol^{j}-ax
Gloss	*(old) woman*		*salt*	

As a rule, native roots are monosyllabic. However, if the root does contain more than one syllable, stress may be fixed on any of them.

2.2.3 Immobile inflectional stress

In the next accentual class, traditionally labelled with the letter B, stress falls on the first syllable of the ending, if any. In the absence of an overt ending, the root is stressed. Melvold (1990) refers to the respective roots as **post-accenting**. According to Loban (1957), all non-derived post-accenting nouns belong to the masculine gender. Biryla (1986) provides a rather lengthy list of apparently post-accenting feminine nouns, some of which are non-derived. A more detailed discussion of this controversy must be postponed until after all the basic accentual patterns of Belarusian have been presented. At this point, suffice it to say that all the non-derived feminine nouns cited by Biryla (*op. cit.*) as post-accenting are either *singularia tantum* or recent borrowings from Russian. In the former case, the decision to include them in Class B is arbitrary. In the latter case, as we shall argue, the prescriptive plural forms, which copy the original Russian accentuation, are circumvented through the avoidance of plural forms.

[5] The voiceless bilabial stop results from final devoicing.

Table 2-3: Accentuation of Class B nouns: a monosyllabic root

Gloss	*Table*	
	Number	
Case	**Singular**	**Plural**
Nominative	'stoł	sta'ł-i
Genitive	sta'ł-a	sta'ł-ow
Dative	sta'ł-u	sta'ł-am / sta'ł-om*
Accusative	'stoł	sta'ł-i
Instrumental	sta'ł-om	sta'ł-am^{j}i
Locative	sta'l^{j}-e	sta'ł-ax / sta'ł-ox*

The statement that Class B nouns are stressed on the root in absence of an overt ending must be refined in the view of the accentuation of Class B nouns with polysyllabic roots:

Table 2-4: Accentuation of Class B nouns: disyllabic root

Gloss	*Badger*	
	Number	
Case	**Singular**	**Plural**
Nominative	bar'suk	barsu'k^{j}-i
Genitive	barsu'k-a	barsu'k-ow
Dative	barsu'k-u	barsu'k-am / barsu'k-om*
Accusative	barsu'k-a	barsu'k-ow
Instrumental	barsu'k-om	barsu'k-ami
Locative	barsu'k-u	barsu'k-ax / barsu'k-ox*

As the nominative singular form *bar'suk* shows, stress in uninflected forms is assigned to the ***last syllable*** of the root.

2.2.4 Major alternating stress patterns

There are two major alternating patterns in Belarusian. We begin with the one traditionally labelled with the letter C. As one can see from the examples below, it involves the alternation of stress between the root in the singular and the endings in the plural.

Table 2-5: Accentuation of o-stem Class C nouns

	Masculine		**Neuter**	
Case	**Singular**	**Plural**	**Singular**	**Plural**
Nominative	'dup	du'b-ɨ	'polʲ-e	pa'lʲ-i
Genitive	'dub-a	du'b-ow	'polʲ-a	pa'lʲ-ow
Dative	'dub-u	du'b-am / du'b-om*	'polʲ-u	pa'lʲ-am / pa'lʲ-om*
Accusative	'dup	du'b-ɨ	'polʲ-e	pa'lʲ-i
Instrumental	'dub-am	du'b-amʲi	'polʲ-em	pa'lʲ-amʲi
Locative	'dubʲ-e	du'b-ax / du'b-ox*	'polʲ-i	pa'lʲ-ax / pa'lʲ-ox*
Gloss	*oak tree*		*field*	

In order to provide a refined description of this pattern, one needs to consider nouns with polysyllabic roots. As all the singular forms are stressed on the same syllable of the root and all the plural forms are stressed on the ending, we omit some case forms in the table below:

Table 2-6: Accentuation of Class C nouns with polysyllabic roots

Gloss	*pigeon*, masculine	
	Number	
Case	**Singular**	**Plural**
Nominative	'ɣołup	ɣału'b-ɨ
Genitive	'ɣołub-a	ɣału'b-ow
Instrumental	'ɣołub-am	ɣału'b-amʲi

As the table demonstrates, in the singular, stress is assigned to the ***first syllable*** of the root; in the plural, stress falls on the first syllable of the ending.

The reader will have noted that all the nouns used to illustrate this accentual pattern belong to the o-stem declension type; correspondingly, they are either masculine or neuter. The limitation reflects the fact that in Belarusian, unlike Russian, pattern C is limited to masculine and a few neuter nouns. Another important difference between the two languages is that in Belarusian, there are no alternations within the singular or plural paradigms: all the alternations are between paradigms. This generalization, however, is not without exceptions.

Several dozen masculine Class C nouns, mostly taking the locative ending *-u*, are stressed on the ending in the locative singular: *mia'xu* 'sack,' *ba'rɨ* 'pinewoods,' *ba'ku* 'side,' etc.[6] It is not uncommon for forms stressed on the locative ending *-u* to be part of adverbial phrases: *u sa'ku* 'in the prime of life', literally: 'in the sap'; *na xa'du* 'on the run, in motion'; *na kra'ji* 'on the verge.' In quite a few cases, variant locatives with the ending *-e* exist; such forms are stressed on the root: *mʲa'du* 'honey' Loc. Sg but *'mʲodʲe*.

While the above exceptions are part of the norm, stress alternations within the singular paradigm of feminine a-stem nouns are not part of Standard Belarusian. Compare the accentuation of the following Russian and Belarusian cognates:

Table 2-7: Juxtaposition of the Russian and Belarusian cognates of 'water'

	Russian		**Belarusian**	
Case	**Singular**	**Plural**	**Singular**	**Plural**
Nominative	vʌ'd-a	'vod-ɨ	ʊa'd-a	'ʊod-ɨ
Genitive	vʌ'd-ɨ	'vot	ʊa'd-ɨ	'ʊod-aw / 'ʊot
Accusative	'vod-u	'vod-ɨ	ʊa'd-u	'ʊod-ɨ
Gloss	*water*			

In the Belarusian cognate of 'water,' root stress is limited to the plural paradigm, and all the singular forms exhibit inflectional stress. The Russian cognate has root stress not only in the plural but also in the accusative singular form *'vodu*.[7] What does not transpire from the table is that the Belarusian cognate does not belong to Class C at all, as be-

[6] The locative *ba'ku* and the genitive *'boku* are contrasted by stress (vowel neutralization is secondary).

[7] When similar forms do occur in Standard Belarusian, they are considered substandard or regional.

comes clear from the comparison of the accentual behaviour of the Russian feminine Class C noun *golova* 'head' with its Belarusian counterpart:

Table 2-8: Juxtaposition of the Russian and Belarusian cognates of 'head'

	Russian		Belarusian	
Case	**Singular**	**Plural**	**Singular**	**Plural**
Nominative	gəɬʌ'v-a	'gołəv-ɨ	ɣała'ʊ-a	ɣa'ɬoʊ-ɨ
Genitive	gəɬʌ'v-ɨ	gə'ɬof	ɣała'ʊ-ɨ	ɣa'ɬow / ɣa'ɬoʊ-aw
Dative	gəɬʌ'vʲ-e	gəɬʌ'v-am	ɣała'ʊ'-e	ɣa'ɬoʊ-am
Accusative	'gołəv-u	'gołəv-ɨ	ɣała'ʊ-u	ɣa'ɬoʊ-ɨ
Instrumental	gəɬʌ'v-oj	gəɬʌ'v-amʲi	ɣała'ʊ-oj(u)	ɣa'ɬoʊ-amʲi
Locative	gəɬʌ'vʲ-e	gəɬʌ'v-ax	ɣała'ʊʲ-e	ɣa'ɬoʊ-ax

As we see from the table, root stress in the Russian pattern is assigned to the ***first*** syllable of the root: ['gołəv-ɨ], while in Belarusian it is assigned to the ***last*** syllable of the root: [ɣa'ɬɔʊ-ɨ]. To match the nomenclature used in Biryla (1986), let us label this pattern, in which stress falls on the endings in the singular and on the last syllable of the root in the plural, with the letter D. Obviously, this description of pattern D subsumes nouns with monosyllabic roots like *vada*. Pattern D can also be followed by neuter nouns, as demonstrated below:

Table 2-9: Example of a neuter Class D noun

Gloss	*feather*	
	Number	
Case	**Singular**	**Plural**
Nominative	pʲa'r-o	'pʲor-ɨ
Genitive	pʲa'r-a	'pʲor-aw
Dative	pʲa'r-u	'pʲor-am
Accusative	pʲa'r-o	'pʲor-ɨ
Instrumental	pʲa'r-om	'pʲor-amʲi
Locative	pʲa'r-ɨ	'pʲor-ax

A slightly different picture is observed in neuter nouns whose roots contain yers (vowels alternating with zero):

Table 2-10: Accentuation of neuter nouns with a root vowel alternating with zero (yers)

Gloss	*bucket*	
	Number	
Case	**Singular**	**Plural**
Nominative	vʲa'dr-o	'vʲodr-ɨ
Genitive	vʲa'dr-a	'vʲodzʲer / 'vʲodr-aw
Dative	vʲa'dr-u	'vʲodr-am

If the genitive plural is formed with a zero ending, the stressed vowel is no longer root-final in the output: *'vʲodzʲer*. The reason for this is the vocalization of the yer in the last syllable. In our analysis, we shall assume without further discussion that, in cases like this, vocalized yers are invisible to accentuation. An extensive discussion of the grammar of yers in the context of Russian stress is conducted by Melvold (1990).

When describing the accentual Class B, we noted that the literature shows some disagreement concerning its distribution is Belarusian. While Loban (1957) makes it clear that the accentual pattern B is characteristic of masculine nouns only, Biryla (1986, p. 75) lists more than a hundred feminine nouns as Class B, most of them derived and some non-derived. However, in many cases the grounds for this classification are unclear. As Biryla himself notes (*op. cit*., p. 76), 'Most of the words listed above do not have plural forms; when such forms do exist, they are rarely used.'[8] Now, in the absence of evidence from plural forms, there is absolutely no reason to assign feminine nouns that are stressed on the inflection in the singular to Class B rather than Class D. In the table below, we compare the two accentual patterns. R stands for 'root,' E stands for 'ending.'

[8] Translation from Belarusian here and elsewhere is ours – A.D.

Table 2-11: Comparison of the accentuation of Class B and Class D nouns

	Singular	Plural
Class B	RÉ	RÉ
Class D	RÉ	ŔE

We have shaded the identical stress pattern in the singular. Clearly, one cannot classify a noun on the basis of its accentuation in the singular alone. In this situation, in order to classify *singularia tantum* nouns, one is compelled to fall back upon systemic considerations. As there are no native non-derived feminine words that follow the accentual pattern B, the respective *singularia tantum* nouns should be classified as Class D.

There are some countable non-derived feminine nouns (all of them relatively recent borrowings from Russian) which, according to the prescriptive norms, retain the post-accenting pattern B of the original Russian source words. One of the examples cited in Biryla (1986) is *kałan'ča* 'fireman's watch tower,' a noun of Turkic origin borrowed through Russian. He claims that all the singular and plural forms of this word are stressed on the endings, as indeed is the prescriptive norm.[9] As a matter of fact, although the word is countable, it is hardly ever used in the plural. When writing this chapter, we conducted a web search for different forms of *kałan'ča* using the Google search engine with the filter 'return pages written in Belarusian.' The search resulted in several hundred hits of the word used in the singular. As far as the plural is concerned, the search returned only one Nom. Pl. token and none at all in the remaining declension cases. Apparently, the use of this word in the plural is avoided, which renders the prescriptive norms concerning the accentuation of its plural forms quite objectless.

Apparent avoidance of plurals is not the only strategy to accommodate Class B feminine nouns borrowed from or via Russian, as we shall presently demonstrate. In the following table, we compare the accentuation of the Russian noun *grafa* 'graph' with that of its Belarusian counterpart *ɣrafa*.

[9] As checked against the Explanatory Dictionary of the Belarusian Literary Language (Sudnik & Kryŭko, 2002).

Table 2-12: Accentuation of the Russian and Belarusian cognates of 'graph'

	Russian		Belarusian	
Case	**Singular**	**Plural**	**Singular**	**Plural**
Nominative	grʌ'f-a	grʌ'f-ɨ	ɣra'f-a	'ɣraf-ɨ
Genitive	grʌ'f-ɨ	'graf	ɣra'f-ɨ	'ɣraf / 'ɣraf-aw
Dative	grʌ'fʲ-e	grʌ'f-am	ɣra'fʲ-e	'ɣraf-am
Accusative	grʌ'f-u	grʌ'f-ɨ	ɣra'f-u	'ɣraf-ɨ
Instrumental	grʌ'f-oj	grʌ'f-amʲi	ɣra'f-oj	'ɣraf-amʲi
Locative	grʌ'fʲ-e	grʌ'f-ax	ɣra'fʲ-e	'ɣraf-ax
Gloss	*column, graph*			

The Russian noun is stressed on any overt ending both in the singular and the plural, thus conforming to the accentual pattern B. Its Belarusian counterpart, however, has retained inflectional stress in the singular only. All the plural forms are stressed on the root. Because the root is monosyllabic, this noun could potentially be classified as either Class C or Class D in Belarusian. Since all native feminine a-stem nouns belong either to Class A or to Class D, *ɣra'fa* has to be classified as Class D for systemic reasons. Clearly, the accentuation of this word has been adjusted to fit the native system. To conclude, we see no compelling reasons to revise Loban's (1957) generalization that, in Belarusian, the accentual patterns B and C are limited to o-stem (masculine and neuter) nouns and that non-derived feminine a-stem nouns can only belong either to Class A or to Class D.

2.2.5 Minor alternating stress patterns

The stress patterns we are going to present in this subsection are the only ones that involve intraparadigmatic stress alternations. In the pattern which we label C_1, stress falls on the root in the singular and in the nominative/accusative plural. The remaining plural case forms are stressed on the ending. This accentual pattern is the only mobile pattern in the group of feminine nouns of the i-stem declension type, the absolute majority of which have immobile root stress (Class A).

Table 2-13: The accentual pattern C_1 exemplified by the cognate of 'night'

	Feminine i-stem	
Case	**Singular**	**Plural**
Nominative	'noč	'noč-ɨ
Genitive	'noč-ɨ	na'č-ej / 'noč-aw
Dative	'noč-ɨ	na'č-am
Accusative	'noč	'noč-ɨ
Instrumental	'noč:-u / noč-aj*	na'č-am^{j}i
Locative	'noč-ɨ	na'č-ax

Beside a handful of feminine i-stem nouns, this accentual pattern is followed by the masculine noun *zub* 'tooth' and a couple of neuter nouns referring to human/animal body: *voka* 'eye', *vuxa* 'ear.' The accentuation of these exceptional o-stem nouns is illustrated in the abridged declension table below:

Table 2-14: Accentuation of exceptional o-stem C_1 nouns

	Masculine		Neuter	
Case	**Singular**	**Plural**	**Singular**	**Plural**
Nominative	'zup	'zub-ɨ	'ʊux-a	'ʊuš-ɨ
Genitive	'zub-a	zu'b-ow	'ʊux-a	ʊu'š-ej
Dative	'zub-u	zu'b-am / zu'b-om*	'ʊux-u	ʊu'š-am / ʊu'š-om*
Accusative	'zup	'zub-ɨ	'ʊux-a	'ʊuš-ɨ
Gloss	*tooth*		*ear*	

Another alternating stress pattern is characterized by immobile inflectional stress in the singular, whereas the accentuation of plural forms is the same as in pattern C_1. In view of the fixed inflectional stress in the singular and the mostly inflectional stress in the plural, we label this pattern B_1. Interestingly, the pattern is also limited to a couple of nouns referring to body parts, vis. *ru'ka* 'arm' and *na'ɣa* 'leg.'

Table 2-15: The exceptional accentual pattern B_1

Gloss	*leg*	
	Number	
Case	**Singular**	**Plural**
Nominative	na'ɣ+a	'noɣ^{j}+i
Genitive	na'ɣ^{j}+i	'noɣ
Dative	na'z^{j}+e	na'ɣ+am
Accusative	na'ɣ+u	'noɣ^{j}+i
Instrumental	na'ɣ+oj	na'ɣ+am^{j}i
Locative	na'z^{j}+e	na'ɣ+ax

There is a handful of *singularia tantum* nouns that follow a special accentual pattern, in which stress falls on the case ending, if any, except for the Instr. Sg, e.g.: Nom./Acc. ['krow] 'blood', Gen./Dat./Loc. [kri'ʊ^{j}i], Instr. ['krowju].[10] Let us label this pattern Class B_2.

Altogether, there are hardly more than a dozen nouns belonging to Classes C_1, B_1, and B_2, which is why we refer to the respective accentual patterns as 'minor.' In practice, they may be seen as Class C or B nouns with exceptional stress in some number/case forms. This view of such nouns is consistent with the fact that most of them are high-frequency words referring to human/animal body, and therefore can easily retain archaic or exceptional properties. For example, the prevalent instrumental plural form of *voka* 'eye' is *va'čima* rather than the expected *va'čam^{j}i* – the prevalent form being a remnant of the long-lost *dualis*. Correspondingly, we shall disregard the minor accentual patterns for the purposes of our analysis.

2.2.6 Summary

The somewhat overwhelming diversity of accentual patterns and alternations becomes more manageable if one considers the distribution of stress classes among different

[10] There is also an alternative form: kri'ʊ^{j}oj(u).

genders and declension types. We begin with **masculine** nouns. The following accentual classes are attested for non-derived masculine nouns: Class A, Class C, and Class B. Several exceptional items belong to Class C_1. **Feminine a-stem** nouns belong either to Class A or Class D, with a couple of exceptional B_1 items. **Neuter** nouns exhibit Class A, Class C, and Class D accentual patterns, with a couple of exceptional Class C_1 nouns. The accentual patterns attested in **feminine i-stem** nouns are limited to Class A and Class C_1; exceptional items belong to Class B_2.

To sum up, the distribution of the accentual classes is as follows:

a) Non-alternating accentual patterns:

   Class A – all genders and declension types

   Class B – masculine nouns

b) Major alternating accentual patterns:

   Class C – masculine and neuter nouns

   Class D – feminine a-stem and neuter nouns

c) Minor alternating accentual patterns:

   Class C_1 – feminine i-stem nouns, masculine nouns

   Class B_1 – feminine a-stem nouns

   Class B_2 – feminine i-stem nouns

The remarkable thing about all the major accentual patterns of Belarusian non-derived nouns is that stress alternations, if any, are possible only between the singular and plural paradigms. What is often regarded as a tendency in Common Slavic and Russian, has become a regularity in Belarusian. Apart from the masculine nouns with exceptional locative singular forms, intraparadigmatic alternations are only present in what we call minor alternating patterns, which jointly account for about a dozen nouns. The regularization of accentual patterns is most clearly observable in the case of feminine a-stem nouns. Where Russian has at least 4 major accentual patterns (A, B, C, D)

and a number of minor patterns, Belarusian has one immobile pattern (A) and one alternating pattern (D), with two or three words following the exceptional pattern B_1.

2.3 Accentual variation

2.3.1 Basic facts

It is not uncommon for non-derived masculine nouns in Belarusian to exhibit certain variability as to their accentuation. In all such cases, variants only exist in one paradigm: either the singular or the plural. Nouns in the table below are invariably stressed on the root in the singular. Their plural forms, however, can follow one of the two competing patterns. For some speakers, the entire plural paradigm of a given noun is stressed on the root, while for other speakers the entire paradigm is stressed on the ending. Generally, one of the variants is prevalent and/or considered as prescriptively 'correct.' The examples are adapted from Loban (1957).

Table 2-16: Variation in the accentuation of masculine plural paradigms

Gloss	*son-in-law*	*match-maker*	*banner*	*maple*	*port*	*hornbeam*
Nom. Sg	'zʲatsʲ	'sʊat	'sʲtsʲax	'klʲon	'port	'ɣrap
Preferred Nom. Pl. **Accentual Class**	zʲa'tsʲ+i C	sʊa't+ɨ C	sʲtsʲa'ɣ+i C	'klʲon+ɨ A	'port+ɨ A	'ɣrab+ɨ A
Alternative Nom. Pl. **Accentual Class**	'zʲatsʲ+i A	'sʊat+ɨ A	'sʲtsʲaɣʲ+i A	klʲa'n+ɨ C	par't+ɨ[11] C	ɣra'b+ɨ C

Another kind of accentual variation involves masculine nouns whose plural forms are invariably stressed on the ending, while the entire singular paradigm is stressed either on the root or on the ending, depending on the speaker. In the table below, the singular paradigm is represented by the genitive rather than the nominative case, because the former but not the latter has an overt ending that can bear stress. As before, the examples are adapted from Loban (1957, pp. 205-207).

[11] A recent dictionary only lists this form.

Table 2-17: Variation in the accentuation of masculine singular paradigms

Gloss	*pancake*	*mill*	*raven*	*wolf*	*wild boar*	*pole*
Nom. Pl.	bl^{j}i'n+ɨ	młɨ'n+ɨ	kru'k^{j}+i	ʊaw'k^{j}+i	ʤ^{j}i'k^{j}+i	słu'p+ɨ
Preferred Gen. Sg	bl^{j}i'n+a	młɨ'n+a	kru'k+a	'ʊowk+a	'ʤ^{j}ik+a	'słup+a
Accentual Class	B	B	B	C	C	C
Alternative Gen. Sg	'bl^{j}in+a	'młɨn+a	'kruk+a	ʊaw'k+a	ʤ^{j}i'k+a[12]	słu'p+a
Accentual Class	C	C	C	B	B	B

This is how Loban (1957, p. 203) comments on the variability illustrated above:

> 'The existence of accentual instability indicates that there are ongoing processes in the Belarusian language connected with a shift of stress from one syllable to another. What is the direction of this shift? What are its causes? How big a portion of the lexicon is involved? Answers to those questions would facilitate the standardization of pronunciation.'

For the sake of argument, let us assume that the prevalent form in a pair of accentual variants corresponds to the original accentuation.[13] When compared to the prevalent forms, the ictus in some alternative forms is shifted to the left (*sva'tɨ - 'svatɨ*), while in others it is shifted to the right (*'vowka - vaw'ka*). In terms of syllable counting, we see shifts to the first syllable, to the last syllable, and in the case of disyllabic endings, to the penultimate syllable (*'kl^{j}onam^{j}i – kl^{j}a'nam^{j}i*). If the word 'direction' is taken in its literal meaning, it is unlikely that the variations in question reflect a shift in a particular direction.

In principle, it cannot be excluded that there is a tendency for one of the masculine accentual patterns to be supplanted by some other pattern/patterns. Apparently, this is exactly what has taken place in feminine a-stem nouns, where one of the original accentual patterns (Class C) has almost entirely disappeared.[14] Special research would be necessary in order to establish whether a similar process is going on in masculine nouns.

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[12] This is the current prescriptive norm.

[13] Of course, in a given pair, the alternative accentuation may represent a receding original pattern.

[14] The quantifier 'almost' is used to accommodate data from dialects that retain the original accusative singular forms of the old Class C, e.g. *'z^{j}imu* as opposed to *z^{j}i'mu* in Standard Belarusian.

However, the prima facie evidence seems to be that the accentual variations A~C and B~C are bidirectional.

The above-described accentual variation could have arisen in the standard language due to coexistence of forms originating from different dialectal substrata. However, dialectal contamination has to be refuted as the main source of this variation. As Loban (1957, p. 199) notes, 'The phenomenon of accentual instability cannot be explained by the influence that various dialects exert on the standard language, because this phenomenon is known to exist in each of these dialects.'

2.3.2 Variation and acquisitional ambiguity

In the table below, we juxtapose the accentuation of masculine Class A and Class C nouns. Recall that nouns belonging to one of these two classes may show accentual variation in the plural.

Table 2-18: Juxtaposition of accentual classes A and C

	Class A		**Class C**	
Gloss	*hornbeam*		*matchmaker*	
Case / Number	**Singular**	**Plural**	**Singular**	**Plural**
Nominative	'ɣrap Ŕ	'ɣrab+ɨ ŔE	'sʊat Ŕ	sʊa't+ɨ RÉ
Genitive	'ɣrab+a ŔE	'ɣrab+aw ŔE	'sʊat+a ŔE	sʊa't+ow RÉ

The accentuation of the singular forms (shaded columns) is identical for the two accentual classes.[15] Neither the nominative singular nor any other singular form provides the learner with sufficient information as to the accentual class of a given noun. In distinguishing between Class A and Class C nouns, the information provided by plural forms is absolutely crucial. If the learner fails to receive sufficient evidence from plural forms,

[15] This is always true for nouns with monosyllabic roots. The accentuation of Class A nouns with disyllabic roots coincides with the accentuation of Class C nouns with disyllabic roots only if the former are stressed on the first root syllable.

he may assign a given noun to the wrong accentual class or, perhaps, to both classes. This ambiguity leads quite straightforwardly to accentual variations in the plural, as it is only in the plural that Class A and Class C nouns with monosyllabic roots show different accentuation.

Accentual variability in the singular paradigm is attested in Class B and Class C nouns. Below we juxtapose the two accentual classes.

Table 2-19. Juxtaposition of accentual classes B and C

	Class B		**Class C**	
Gloss	*mill*		*mushroom*	
Case / Number	**Singular**	**Plural**	**Singular**	**Plural**
Nominative	'mɬin Ŕ	mɬi'n+i RÉ	'ɣrip Ŕ	ɣri'b+i RÉ
Genitive	mɬi'n+a RÉ	mɬi'n+ow RÉ	'ɣrib+a ŔE	ɣri'b+ow RÉ

The plural forms of both classes are invariably stressed on the ending. Again, the learner must use evidence from both numbers in order to determine unambiguously the accentual class of a given noun. Insufficient evidence from singular forms could result in the wrong or ambiguous classification.

To sum up, we propose that accentual variation in masculine nouns follows from an inherent ambiguity faced by learners in the process of acquisition. It can be hypothesized that there will be a correlation between the frequency with which a given noun is used in the singular and in the plural (and, correspondingly, the frequency of learners' exposure to the respective forms) and its tendency to exhibit accentual variation.

Loban (1957) offers an explanation of accentual variation which is directly based on the semantics of a given noun. In particular, he suggests that stressed plural endings are characteristic of countable nouns. Correspondingly, the plural forms of nouns that 'have received a concrete meaning'[16] (p. 205) would be influenced by the plural forms of such

[16] 'Concrete' as opposed to 'abstract' – A.D.

countable nouns as *'stol – sta'lɨ*[17] 'table', *'dom – da'mɨ* 'house', *'dup – du'bɨ* 'oak tree.' This explains why Class A nouns (with a fixed root stress) would develop plural variants that are stressed on the ending. What the hypothesis cannot possibly explain is the existence of accentual variation of the Class B ~ Class C type, because plural endings are stressed in both these patterns. Still, the semantics of a given noun may indeed be a factor in determining the relative frequency of its singular *versus* plural usage and, as a consequence, the frequency with which a learner is exposed to the respective forms in the process of acquisition.

2.3.3 Stability of the accentuation of feminine nouns

Unlike masculine nouns, feminine a-stem nouns show very little accentual variation. Loban (1957) again offers an explanation based on semantics. As we have mentioned, he proposes that there is a link between the semantic properties of a given masculine noun and its accentual class. Apparently, this correlation is absent in feminine nouns: 'One does not observe in feminine nouns the same evident mutual dependence between the semantic categories and accentual classes which is so clearly present in masculine nouns. Perhaps this is the reason why feminine nouns are characterized by much greater accentual stability' (*op. cit.*, p. 227).

When discussing the variability of the accentuation of masculine nouns, we proposed that it might be due to acquisitional ambiguity. The accentuation of Class A and Class C nouns with monosyllabic roots is identical in the singular, so the learner needs data from the plural for proper classification. Class B and Class C nouns have inflectional stress in the plural, so the learner needs data from their singular paradigms in order to distinguish between the two classes. While inflectional stress in the singular is unique to Class B[18] and root stress in the plural is unique to Class A, the accentuation of pattern C is not unique in either paradigm. Correspondingly, both singular and masculine forms must be taken into account when establishing that a given masculine noun follows the accentual pattern C.

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[17] Nom. Sg – Nom Pl.

[18] This is true of oblique cases only. Due to the lack of an overt ending in the nominative singular of masculine nouns, this form contributes no information as to the accentuation of words with monosyllabic roots. If the root is disyllabic, the information provided by the nominative singular is always ambiguous: initial stress corresponds to pattern A or pattern C, root-final stress corresponds to pattern A or pattern B.

Non-derived feminine a-stem nouns in Standard Belarusian can follow only two accentual patterns: pattern A (stress fixed on a root syllable) or pattern D (inflectional stress in the singular, stress on the last syllable of the root in the plural). In the table below, we juxtapose the accentuation of Class A and Class D feminine nouns with monosyllabic roots.

Table 2-20: Juxtaposition of accentual classes A and D

	Class A		**Class D**	
Gloss	*(an old) woman*		*water*	
Case / Number	**Singular**	**Plural**	**Singular**	**Plural**
Nominative	'bab+a ŔE	'bab+ɨ ŔE	ʊa'd+a RÉ	'ʊod+ɨ ŔE
Dative	'bab^{j}+e ŔE	'bab+am ŔE	ʊa'd͡z^{j}+e RÉ	'ʊod+am ŔE

The plural forms of both nouns are stressed on the only syllable of the root, so they are uninformative as to which accentual class the respective noun belongs to. Above we hypothesized that this kind of ambiguity underlies the accentual variation in masculine nouns. Why does it fail to cause stress variation in feminine nouns? Note that any singular form whatsoever is sufficient to determine the accentual class of a non-derived feminine a-stem noun. On the other hand, plural forms do not provide useful accentual information. As a working hypothesis, one could suggest that the plural paradigms of feminine a-stem nouns are disregarded in the process of acquisition of accentual patterns, so their accentual ambiguity does not cause variation.

2.4 A tonal analysis of the accentuation of non-derived nouns in Belarusian

2.4.1 Input representation of accentual properties

The analysis set forth in this section is based on the assumption that the accentual properties of Belarusian morphemes are encoded with an autosegmental feature. Input instances of the feature can be either pre-associated or floating. In this respect, the foundations of the analysis are identical to those in Revithiadou (1999). There are, however, some non-trivial differences. The autosegmental accentual feature in Revithiadou's analysis comes in two flavours: a strong accent and a weak accent. A strong accent is realized as high pitch in pitch-accents systems and as a foot head in stress systems. A weak accent is realized as low pitch or a foot tail correspondingly. Note that the feature is construed as directly interpretable by phonetics in pitch-accent systems, but in stress systems it is but a placeholder for foot heads, much like an asterisk. In addition, the realization of the accentual feature in stress systems is often determined by metrical requirements (for more details, see the respective sections of the previous chapter). In our analysis, the output feature independently determines the location of word ictus and can in principle be seen as directly interpretable by phonetics in pitch-accent systems as well as in stress systems.[19] At this point, we would like to raise the following issue concerning Revithiadou's accentual feature. The feature is described as tone-like, it has two values (strong and weak), and it can be realized as high or low pitch depending on its value. One can legitimately ask what exactly sets this feature apart from the well-established concept of tone. Are Revithiadou's strong and weak accents simply high and low tones in disguise? As far as pitch-accent systems are concerned, this interpretation avoids what seems to be an unnecessary multiplication of entities while remaining fairly uncontroversial. The application of this interpretation to stress systems is not quite so straightforward, as it calls for acknowledging that tone is a more abstract feature than usually assumed. If, as we propose, tone is directly interpretable in stress systems as well as in pitch-accent systems, then one is forced to admit that tone has no universal phonetic expression – just like metrically determined, surface-predictable stress. The feature

[19] In our review of Revithiadou (1999), we have pointed out that evidence for the nature and indeed the very existence of foot structure in Russian is at best inconclusive. However, nothing hinges in our analysis of Belarusian on the assumption that the language lacks feet. What we *do* propose is that, whatever foot structure might be there, it has no influence on the location of word ictus.

is used to encode surface-unpredictable word prominence irrespective of the phonetic expression of prominence in a particular language. In pitch-accent languages, it is expressed as pitch movement. In free-stress languages, it is expressed by means of stress cues.

One of the recurrent properties of restricted tone (and, more specifically, pitch-accent) languages is that only high tone is encoded in the input, low tone being assigned by default. In exceptional cases, low tone is encoded in the input. Given our proposal that Revithiadou's strong and weak accents are high and low tones correspondingly, one should expect the same generalization to hold for the tonal representations of prominence. In the general case, only morphemes that attract prominence are specified for [high] tone. Toneless morphemes are neutral with respect to prominence. Morphemes that exceptionally contain a low tone in the input 'reject' prominence. In our analysis of Belarusian stress, inputs are analyzed as either toneless or containing a high tone.

Although the accentual feature in Revithiadou's OT analysis is supposed to have tone-like properties, the linking/delinking of this feature is treated as not violating any constraints or, perhaps, as violating constraints that are never relevant for the choosing of the optimal output. One of the properties of tone in OT analyses is that the creation or deletion of association lines between the feature and its bearing unit is not 'free': there are constraints militating against the linking/delinking of tone just like there are constraints against the insertion/deletion of tone. In Revithiadou's analysis, a pre-associated accentual feature is just as prone or as resistant to deletion as a floating one, because the deletion of either of them is only seen as a violation of MAX. In our analysis, floating accentual features are more prone to deletion than pre-associated ones for the reason that in the former but not in the latter case, the constraint against delinking is not violated. This apparent 'technicality' adopted from OT analyses of tonal systems plays an important role in our analysis of the accentuation of non-derived nouns and leads to interesting insights into the phenomenon of accentual dominance/recessiveness in derived words.

The requirement we have set for our analysis is that it should be not only descriptively adequate (that is to say, able to generate all the major accentual patterns attested in non-derived nouns) but also as simple as possible. When assessing simplicity, two aspects are taken as relevant: the complexity of inputs should be comparable to that employed in competing analyses; the use of non-standard OT tools should be avoided or

minimized. It is our hope that the simplicity requirements, subjective as they may be, will keep the analysis free of superfluous or potentially too powerful elements.

The foundations of our analysis are as follows. A morpheme may contain one and only one instance of tone in the input.[20] The feature can be floating or pre-linked to a particular position. If successfully mapped onto the output, it is realized as word ictus. No word may contain more than one such feature in the output.

We begin with considering the logically possible representations of non-derived nouns. In Belarusian, such nouns will generally consist of a [predominantly monosyllabic] root and an overt case/number ending. The first group of representations contains roots with a pre-linked H.

Figure 2-1: Input representations of nouns whose roots host a pre-linked H

In (a), the case ending is not specified for prominence. In (b), both the root and the endings sponsor instances of H, but the tone sponsored by the ending is non-associated (floating). In (c), both the root and the ending have an associated H. If the constraint against the delinking of tone (*DELINK) is ranked sufficiently high, both (a) and (b) will have the same output with a root stress. In the figure below, we place the floating H sponsored by the ending in parenthesis to indicate that the output does not depend on its presence.

Figure 2-2: Schematic input-output mapping of a noun with a pre-linked H on the root and a floating H on the ending

[20] Occasionally, the feature will be variously referred to as the ‘accentual feature’ or ‘prominence feature’ in the ensuing text.

As every output form must have one and only one instance of H (CULMINATIVITY >> *DELINK), the grammar must choose which input instance of tone to output. The choice can be made through different mechanisms, e.g. alignment preferences or positional faithfulness:

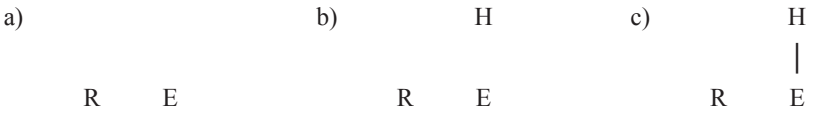
Figure 2-3: Different ways to satisfy CULMINATIVITY

a) Left-edge alignment or high-ranked root faithfulness

b) Right-edge alignment or high-ranked suffix faithfulness

In the representations below, the root does not sponsor a prominence feature. The accentuation of noun forms with such roots will be determined by the grammar depending on the tonal specification of a particular ending.

Figure 2-4: Input representations of nouns with toneless roots



Let us assume that the grammar does not allow tone to be outputted on morphemes other than its sponsor. In (c), the pre-linked H sponsored by the ending is outputted without any modification. Provided that the grammar can only insert an H if none is already present in the input, the only way to ensure that there is an H in the output of (b) is to create an association line linking the floating H to its sponsor:

Figure 2-5: The association of a floating tone to its source morpheme

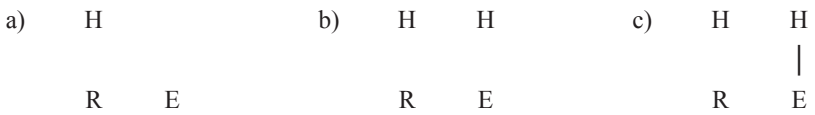
This input-output mapping corresponds to a grammar in which a floating H must become associated to its sponsoring morpheme. In a grammar with final extratonality or one in

which floating input tones are preferred not to dock on their sponsoring morpheme, the H would be outputted on the root.

In the input in Fig. 2-4(a), neither of the constituent morphemes sponsors an H. Whether or not an H is inserted (and if so, at what location) depends on the grammar. Suppose that tone cannot be inserted by the grammar. Does it mean that the word will surface without a prominence peak? In fact, this is exactly what apparently happened in the case of Common Slavic *enclinomena* – word forms with no underlying tone (Jakobson, 1963). Normally, they would become part of phonological words formed by other lexical items and thus would surface without a separate prominence peak. In isolation or in an appropriate context, they surfaced with a word-initial falling pitch contour[21] (or perhaps with a dynamic stress). In Belarusian, all content words always form separate phonological words. In our model, this could mean that outputs corresponding to inputs without an underlying tone are either supplied with this feature by the grammar (CULMINATIVITY >> DEPT) or are simply stressed by default (DEPT undominated).

Finally, let us consider the case where the root has a floating H in the input.

Figure 2-6: Input representations of nouns whose roots sponsor a floating H



Again, in (c), the pre-linked H wins due to the ban on delinking. In (b), the choice between the two instantiations of H will be made by the grammar. In (a), if the grammar does not enforce tone displacement, H will be outputted on the root. In the case of polysyllabic roots, the docking location of tone will be determined by alignment constraints.

[21] This could mean that that the grammar did in fact insert tone in these circumstances.

2.4.2 Tonal representations of the accentual patterns of Belarusian

2.4.2.1 Pattern A

We begin with the discussion of non-derived nouns with a fixed root stress (Class A). The input representations and processing principles sketched above provide a straightforward way of encoding this pattern. For the time being, let us assume that the inputs of inflectional endings either lack tone or contain floating tones. Granted this, a pre-linked H sponsored by the root will always surface faithfully, as illustrated in the schematic input-output mappings below. The bracketed (H) on the ending indicates that it contains no tone or a floating tone.

Figure 2-7: Faithful outputting of a pre-linked H sponsored by the root

Here are some of the properties of a grammar that would result in such a mapping. Delinking of association lines that are present in the input is forbidden (*DELINK is ranked high). No new association lines are created if there is at least one association line in the input (*LINK is ranked high). No floating tones are allowed in the output (*FLOAT undominated).

How does this model compare to the competing accounts? In an analysis performed along the lines of Melvold (1990), a root vowel would be marked as accented. When concatenated with either an unaccented or an accented case ending, the root receives stress by the Basic Accentuation Principle ('stress the first accented vowel'). In Revithiadou's (1999) analysis, root accent wins over inflectional accent thanks to a special kind of positional faithfulness (roots, unlike endings, are morphological heads, and the accents of morphological heads prevail over accents sponsored by other morphemes). The system of representation adopted in our analysis is not any more complex than that employed by Revithiadou. The crucial difference lies in our recognition of the fact that OT constraints can refer to association lines. When an input contains an associated H and a floating H, the former but not the latter will be outputted thanks to the constraint against delinking.

2.4.2.2 Pattern D

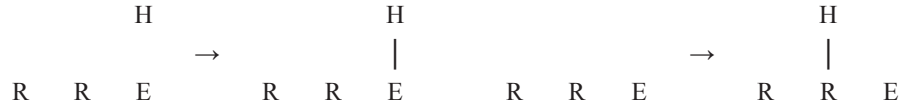
Fixed root stress prevails among all the genders and declension types. Alternating accentual patterns are specific to the gender and/or declension types. Thus, ***pattern D*** is characteristic of feminine and neuter nouns. Recall that the pattern involves inflectional stress in the singular and root-final stress in the plural. As far as feminine a-stem nouns are concerned, it is the only alternating pattern. The analysis of this pattern proposed in Melvold (1990) is fairly complex. The respective roots are marked as bearing an underlying accent on the last syllable of the root; in addition, they are diacritically marked as triggering post-accentuation before inflectional endings. Further, they are marked for stress retraction in the plural. The complexity of the analysis is justified by the fact that, apart from the non-alternating patterns A and B, Russian a-stem feminine nouns exhibit two alternating accentual patterns: C and D. The corresponding roots are analyzed respectively as accented (A), post-accenting (B), unaccented (C), and finally post-accenting with retraction in the plural (D). From the point of view of this analysis, the roots of Belarusian a-stem feminine nouns are of two types: 1) accented and 2) post-accenting with retraction. In dialects, some of the nouns that follow pattern D in Standard Belarusian retain the original pattern C: *'vodu* 'water' Acc. Sg, *'z^{j}imu* 'winter' Acc. Sg as opposed to the standard *va'du, z^{j}i'mu*. That such nouns originally belonged to Class C is also confirmed by data from other Slavic languages. Given Melvold's analysis recapitulated above, the accentuation of feminine a-stem nouns in Belarusian has been levelled up in such a way that pattern C nouns, formed by previously accentually unspecified roots, have shifted to pattern D, whose roots are triply marked as accented, post-accenting and retracting.

In view of the fact that pattern D has superseded pattern C in Belarusian feminine nouns, we opt for as simple an analysis of pattern D as possible. The fact that singular forms are stressed on the endings is interpreted as indicating that all the inflectional suffixes have a non-associated H in the input. As far as the roots are concerned, the zero hypothesis is that they are toneless. In the plural, both the roots and the endings can be analyzed as toneless. One possibility is that the grammar inserts an H on a toneless form and aligns it with the right edge of the stem. Another possibility is that word prominence is assigned to the stem-final syllable without the mediation of an H (e.g. metrically, as in Crosswhite *et al*., 2003). In terms of constraints, the first grammar would require that H be aligned with the right edge of the stem; the second grammar would require that the head of a phonological word be aligned with the right edge of the stem. In the figure

below, R stands for a root syllable (we use a disyllabic root to better illustrate the stem-final alignment).

Figure 2-8: Schematic input-output mapping of pattern D nouns

a) singular b) plural



As far as the plural forms are concerned, alignment with the right edge of the stem plays a crucial role. In the tableau below, R stands for a root syllable, E stands for the ending, and the output location of high tone is marked with an acute (´):

Table 2-21: The role of Align-R (H, Stem) in the accentuation of the plurals of pattern D nouns

	RRE	CULMIN	*LINK	MAX(T)	DEP(T)	ALIGN-R (H, stem)
a	ŔRE		*		*	*!
b	☞RŔE		*		*	
c	RRÉ		*		*	*!
d	RRE	*!				

The fully faithful candidate *d*, whose input and output contain no tone, fatally violates CULMINATIVITY. All remaining candidates tie on faithfulness constraints, as each of them involves the insertion of a high tone and the creation of a new association line. Candidates *a* and *c* fatally violate the alignment constraint, so candidate *b* is chosen as the optimal one.

The above system of constraints fails in the analysis of the singular forms of pattern D and B nouns. In the tableau below, the floating high tone sponsored by the ending is symbolized by an 'H' over E in the input.

Table 2-22: Failure of the grammar to choose the correct output of a singular pattern D/B noun

	H RR E	CULMIN	*LINK	MAX(T)	DEP(T)	ALIGN-R (H, stem)
a	ŔRE		*			*!
b	☞RŔE		*			
c	☹RRÉ		*			*!

The grammar incorrectly chooses candidate *b*, in which the input high tone sponsored by the ending is realized on the second syllable of the root. We return to this problem at a later point in our discussion.

Naturally, our model allows for a number of alternative analyses. For example, roots of pattern D nouns can be analyzed as containing a floating H in the input. The inflectional stress in the singular would be due to the shifting of the underlying H onto the inflection.[22] This solution requires that the shift be blocked in the plural (e.g. due to a low tone in the input of plural inflections). Another possibility is that both the root and the endings contain an unassociated H, and the inflectional H is outputted thanks to alignment or positional faithfulness constraints. In the plural, the H sponsored by the root has no competition and docks at the right edge of its sponsoring morpheme due to alignment requirements.

Ultimately, some of the above analyses may prove to be more adequate than others after data from other non-derived or derived word categories have been taken into account. At this point, however, we choose the least complex analysis of all, namely that the roots of pattern D nouns are unspecified for tone. The analysis of plural forms implies that the default position for H is at the right edge of the stem. This is compatible with the observation that nonce words and unfamiliar borrowings in Russian tend to be stressed on the last syllable of the stem (provided that the same tendency holds for Belarusian).

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[22] This is basically how Revithiadou (1999) analyses post-accentuation. She posits that post-accenting roots contain a floating accentual feature outputted on the neighbouring morpheme due to the constraint *DOMAIN, which bans features from being realized on their source morphemes.

2.4.2.3 Pattern C

The accentual pattern C is characteristic of masculine and a few neuter nouns. In this pattern, stress is assigned to the first syllable of the root in the singular and to the ending in the plural. For the sake of convenience, we provide a brief illustration of the pattern in the table below.

Table 2-23: Example of a Belarusian Class C noun with a disyllabic root

Gloss	*town*	
Case / Number	**Singular**	**Plural**
Nominative	'ɣorat	ɣara'd+ɨ
Genitive	'ɣorad+a	ɣara'd+ow

In Melvold's model, the root and the singular case endings are analyzed as unaccented and the plural case endings as accented. Correspondingly, plural forms are stressed on the endings. The location of stress in singular forms, containing no accented morpheme, is determined by the Basic Accentuation Principle ('stress the leftmost syllable, if there are no underlying accents'). Clearly, this analysis is incompatible with our account of the accentual pattern D, where we follow Crosswhite *et al.* (2003) in assuming that the respective roots are unaccented (in their model, the roots contain no underlying metrical structure, in our model they are toneless).

While most of the existing accounts of Russian stress analyze the roots of Class C nouns as unaccented, Alderete (1999) takes a different approach and proposes that the inputs of such roots contain an accent on the first vowel (just like Class A nouns with a fixed root-initial stress). The shift of stress to the ending in the plural is accounted for by proposing that Class C nouns take ***dominant*** plural endings, which impose output-output anti-faithfulness. The analysis means that, to all intents and purposes, Class C nouns constitute an exceptional group of Class A nouns, the difference being that regular Class A nouns take recessive plural endings, while Class C nouns take dominant ones.

The advantage of this analysis is that it can account for an interesting accentual development characteristic of modern Standard Russian. There is a tendency for some originally Class A nouns (nouns with a fixed root stress) to develop new plural forms

stressed on the inflectional endings. The word *'pasport*, which illustrates this process in the table below, used to be stressed on the first syllable both in the singular and in the plural. The current norm is to stress the inflectional endings in the plural.

Table 2-24: Change in the accentuation of the Russian word *pasport*

Gloss	*ID card, passport*		
Case / Number	**Singular**	**Plural**	
		Obsolete norm	**Current norm**
Nominative	'pasport	'pasport+i̵	paspor't+a
Genitive	'pasport+a	'pasport+ov	paspor't+ov

For some other masculine nouns that have undergone this process, the recommended norm is still to have a fixed root stress in all forms. However, in spoken practice, the respective plurals are commonly stressed on the endings, *cf*. the recommended form *'traktor+i̵* 'tractors' Nom. Pl. and its colloquial alternative *trakto'r+a*. The data has been checked against a normative dictionary (Rozental' & Telenkova, 1984). Note that there is no possibility of distinguishing between Class C nouns and exceptional Class A nouns on the basis of their declension forms only:

Table 2-25: Juxtaposition of a disyllabic Class A and a dissyllabic Class C noun

Glosses	*tractor*		*town*	
Case / Number	**Singular**	**Plural**	**Singular**	**Plural**
Nominative	'traktor	trakto'r+a	'gorod	goro'd+a
Genitive	'traktor+a	trakto'r+ov	'gorod+a	goro'd+ov

However, in all probability, the process is not a mere shift of some nouns from pattern A to pattern C. Recall that pattern C nouns with polysyllabic roots are stressed on the first syllable. As illustrated by the ensuing example, Class A nouns with a fixed stress on non-initial syllables can also develop new plurals. Crucially, the process does not involve a shift of stress in the singular to the initial syllable.

Table 2-26: Accentuation of the noun *professor* in Russian

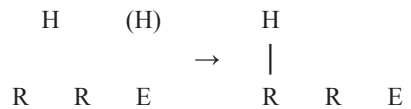
Gloss	*professor, masc.*		
Case / Number	**Singular**	**Plural**	
		Obsolete norm	**Current norm**
Nominative	pro'fessor	pro'fessor+i	professo'r+a
Genitive	pro'fessor+a	pro'fessor+ov	professo'r+ov

Under Alderete's (1999) analysis, the input representations of exceptional Class A nouns are not different from those of Class C nouns: in both groups, the roots are accented on some vowel; in addition, both groups take dominant inflectional endings in the plural. This analysis, however, is not feasible as long as the accentuation of derived words is taken into account. It is well established that the roots of Class A and Class C nouns show different accentual behaviour in derived words. According to Melvold (1990), recessive accented suffixes are stressed after Class C roots but not after Class A roots. In the latter case, derived words retain the root stress of their base. Gouskova (2010) points out that the presence of a secondary stress in compounds depends on the accentual properties of the first root. Namely, according to her, accented (Class A) roots attract secondary stress, while Class C and Class B roots do not. In view of this, it is essential that the inputs of Class C and Class A nouns (also those with exceptional new plurals) be kept distinct.

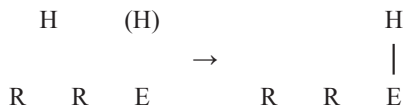
When analyzing pattern D, we proposed that when a toneless root is concatenated with a toneless ending, the grammar inserts an H to satisfy CULMINATIVITY and aligns it with the right edge of the stem. If this analysis is adopted, neither the singular nor the plural forms of Class C nouns can be analyzed as consisting of unmarked morphemes only. Let us see how the accentual pattern C can be accounted for in our model under the assumption that the roots of Class C nouns contain a floating H in the input.

Figure 2-9: Input-output mapping of the floating H on the root of pattern C nouns

a) singular



b) plural



We have made no assumptions about the accentual properties of masculine endings, which is signalled by a bracketed (H) over endings. Suppose that singular endings are toneless. Then the only candidate for outputting is the floating H in the input of the root. Unexpectedly, it docks at the left edge. Recall that our analysis of the plurals of pattern D nouns is based on the tone's alignment with the right edge of the stem: ALIGN-R (H, Stem) – Align the right edge of an H with the right edge of the stem. The left-edge docking in the singular of Class C nouns cannot therefore be due to alignment with the stem. Another possible domain for alignment is the phonological word. This is perhaps a viable option for Russian, where prepositional phrases formed by Class C nouns are stressed on the preposition: *'za golovu* , *'za gorod*, *'pod goru*, *'pod nos*, *'na vodu*.[23] Whatever the analysis, it is clear that ultimately stress is assigned to the leftmost syllable of the phonological word rather than the lexical word or the stem. The Belarusian counterparts of the above prepositional phrases are always stressed on the noun: *za ɣala'vu*, *za 'ɣorat, pad ɣa'ru, pad 'nos, na va'du*. In the case of feminine nouns, the reason is obvious and has nothing to do with alignment: all these nouns have been reanalyzed as belonging to the accentual pattern D. However, the masculine nouns still belong to Class C. The fact that prepositional phrases with such nouns are stressed on the root means that alignment with the phonological word is irrelevant. Alignment with the lexical word will not work either. Suppose the word-initial stress in the singular is due to alignment with the left edge of the lexical word: ALIGN-L (H, L, LxWd, L). This ALIGN-L constraint must outrank the constraint requiring alignment with the right edge of the stem ALIGN-R (H, R, Stem, R). This ranking, however, is incompatible with our analysis of the plurals of pattern D. Recall that we propose that their inputs are toneless (unaccented), and that an H is inserted by the grammar and aligned with the right edge with the stem.

We propose that the relevant alignment constraint is ALIGN-L (H, L, Source, L), which requires that high tone be left-aligned with its lexical source[24] – see Bickmore (2001) for the attribution of the constraint. The constraint is not violated by an inserted H in the plural forms of pattern D nouns for the simple reason that an inserted feature

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[23] The rough translations would be 'at the head', 'out of town', 'under the mountain', 'under the nose', 'on the water' correspondingly. All the nouns are in the accusative. Some sources report that the current tendency is to stress the first syllable of the noun rather than the preposition.

[24] That is to say, its source morpheme.

has no source in the input. In the tableau below, we rank ALIGN-L (H, Source) directly above ALIGN-R (H, Stem).

Table 2-27: A floating input tone aligns with the left edge of its source morpheme

	H RR E	*DELINK	*LINK	MAX(T)	DEP(T)	ALIGN-L (H, Source)	ALIGN-R (H, Stem)
a	☞ŔRE		*				*
b	RŔE		*			*!	
c	RRÉ		*			*!	*

All the candidates tie on faithfulness constraints. In the absence of ALIGN-L (H, Source), the grammar would choose candidate *b*, in which the input tone is realized at the right edge of the root, thus satisfying ALIGN-R. Candidate *a* wins thanks to the satisfaction of ALIGN-L (H, Source).

An interesting bonus of this analysis is that now we can account for the fact that disyllabic endings are always stressed on the first syllable (if at all). If the input of such an ending is analyzed as containing a floating H, then we expect it to be aligned with the left edge of its source morpheme in the output. A preliminary analysis of the accentuation of the singular forms of Class C nouns can be conducted as follows. The roots of such nouns have a floating H in the input, the endings are toneless. Being the only candidate for outputting, the H sponsored by the root is outputted and aligned with the left edge of the root.

In addition, ALIGN-L (H, Source) solves the problem of the singular forms of pattern B and pattern D nouns. In both cases, we posit the same input structure: a toneless root and a floating high tone on the ending. As before, candidates violating Culminativity are omitted from the tableau.

Table 2-28: Evaluation of the singular forms of pattern B and pattern D nouns

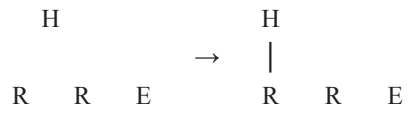
	H RR E	*DELINK	*LINK	MAX(T)	DEP(T)	ALIGN-L (H, Source)	ALIGN-R (H, stem)
a	ŔRE		*			*!	*
b	RŔE		*			*!	
c	☞RRÉ		*				*

Were it not for ALIGN-L (H, Source), the grammar would incorrectly choose candidate *b*, where the output tone is aligned with the right edge of the stem. However, since the tone is sponsored by the ending, its realization on a root syllable violates ALIGN-L (H, Source), so candidates *a* and *b* are excluded. In the optimal candidate *c*, the tone is outputted on the only syllable of its source morpheme, thereby satisfying ALIGN-L.

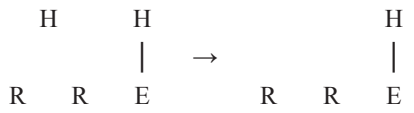
Now we have to account for the fact that Class C nouns are stressed on the inflection in the plural. Suppose that masculine plural endings contain an underlying high tone (or, in traditional terminology, are accented). This feature in our model may or may not be linked in the input. If it is linked, then it is realized thanks to the high ranking of the constraint against delinking: the deletion of a floating H is 'cheaper' than the delinking of a pre-linked H. If it is not linked in the input, then there has to be a mechanism that would make a choice between the two input instances of floating H in favour of the one sponsored by the ending. For the time being, we simply assume that the feature is pre-linked in the input.

Figure 2-10: Input-output mapping of the singular and the plural of pattern C nouns

a) singular



b) plural



2.4.2.4 Pattern B

We now move to the discussion of the post-accenting pattern, which is characteristic of Belarusian masculine nouns belonging to the accentual Class B. In studies of Russian stress, the roots of such nouns have been variously analyzed as: accented on the last vowel and marked for post-accentuation before inflectional endings (Melvold, 1990); containing a left bracket at the right edge (Halle, 1997); unaccented under the assumption that the default stress position in Russian is post-stem (Alderete, 1999); unaccented under the assumption of a lexically indexed word-final default (Gouskova 2010); containing a floating strong accent which is shifted to the following morpheme due to the constraint against its realization on the source morpheme (Revithiadou, 1999). In principle, these analyses can be more or less accurately mimicked in our model. The advantages and disadvantages of the enumerated approaches often become evident only

against the background of their consequences for the analysis of the accentuation of derived words. Correspondingly, we shall return to this issue when discussing how our model can be applied to the analysis of derived words.

At this point, we take the representational simplicity as the decisive factor. The simplest way to account for the post-accenting pattern in non-derived nouns is to assume that their roots are unmarked, while the inflectional endings contain tone.

Figure 2-11: Input-output mapping of post-accenting nouns

It must be remembered, however, that the endings taken by Class B nouns are the same masculine endings taken by Class C nouns. This is the reason why the plural endings are represented as containing a pre-linked H in Fig. 2-11. As far as the singular endings are concerned, there is a serious discrepancy: the analysis of the accentuation of singular forms of Class C nouns was based on the assumption that the respective endings are toneless (unaccented). Let us therefore return to the analysis of Class C nouns and see whether it can be modified in a way compatible with the analysis of Class B nouns presented in Fig. 2-11. Consider the modified input-output mapping of Class C nouns.

Figure 2-12: Modified representation of Class C nouns

In accordance with the above analysis of Class B nouns, we represent the singular endings of masculine nouns as containing an H. The feature cannot be linked in the input, because the inputs of singular and plural forms of Class C nouns would have identical accentual properties and, as a consequence, their outputs would be uniformly stressed on the ending. The choice between the two instances of floating tone could be made through positional faithfulness, e.g. if root faithfulness outranked suffix faithful-

ness. There is an interesting alternative, though. Poletto (1998) proposes the following markedness constraint: STEM (H) – A stem must be associated with a high tone. In our case, this constraint would prefer outputs with an H on the root to those with an H on the endings. In the tableau below, R stands for a root syllable, E stands for an inflectional ending. The input of each morpheme contains a floating high tone (H). The location of the output high tone is marked with the acute symbol (´). The tableau does not include candidates that violate CULMINATIVITY, that is to say, forms with more than one high tone or without tone in the output. The assumption is that the constraint is undominated in Belarusian. Another assumption is that an input high tone can only be realized on its source morpheme, so candidates that would involve tone displacement are not considered.

Table 2-29: Illustration of the role of STEM(H) in the singular forms of pattern C nouns

	H H RR E	*DELINK	*LINK	MAX(T)	DEP(T)	STEM(H)	ALIGN-L (H, Source)	ALIGN-R (H, stem)
a	☞ŔRE		*	*				*
b	RŔE		*	*			*!	
c	RRÉ		*	*		*!		*

The satisfaction of CULMINATIVITY requires the deletion of one of the input tones and, correspondingly, a violation of MAX(T) by each candidate. Similarly, the constraint against the creation of association lines *LINK is violated by all candidates. Candidates *a* and *c* are more harmonic than candidate *b* with respect to alignment, as they both satisfy the higher-ranked ALIGN-L (H, Source). The choice between them is performed by STEM(H): other things being equal, the form with a high tone on the stem is preferred.

The above account is relevant not only to the singular forms of Class C nouns but also to the plural forms of Class A nouns. In our representation of Class A nouns, we assumed that their roots contain a pre-linked H in the input, while the endings either are toneless or contain a floating H, so the whole analysis was based on the constraint against delinking. If, however, masculine plural endings contain a pre-linked H, as we have suggested when discussing Class C and Class B nouns, then the ban on delinking is not sufficient anymore:

Figure 2-13: One of the pre-linked instances of H is deleted to satisfy CULMINATIVITY

In the tableau below, pre-linked input tones are marked with an acute (´) over the respective syllable, so RŔ means that the input root is disyllabic, and that a high tone is linked to the second syllable. As no candidate involves the insertion of tone, the constraint DEP(T) is omitted from the tableau.

Table 2-30: The role of STEM(H) in the plural of masculine pattern A nouns

	RŔÉ	CULMIN	*DELINK	*LINK	MAX(T)	STEM(H)	ALIGN-L (H, Source)	ALIGN-R (H, stem)
a	ŔRE		**!	*	*			*
b	☞RŔE		*		*		*	
c	RRÉ		*		*	*!		*
d	RŔÉ	*!						

Candidate *a* involves two violations of *DELINK: one is incurred through the deletion of the high tone sponsored by the ending and another one is caused by the displacement of the root tone. In order for the tone to move to the beginning of the root, the input association line has to be deleted and a new one is inserted. The fully faithful candidate *d* violates CULMINATIVITY, as it has more than one high tone in the output. Each of the competing candidates *b* and *c* realizes one of the pre-linked high tones. The candidates tie on faithfulness constraints, because each of them involves the delinking and deletion of tone. The optimal candidate *b* wins because it satisfies the constraint STEM (H).

While STEM(H) solves the problem of choosing between two input tones, it brings us back to the issue of the singular forms of pattern B and pattern D nouns. Recall that their inputs are posited to contain a toneless root and a floating high tone sponsored by the ending. Above we have suggested that ALIGN-L (H, Source) has the decisive role in the processing of such forms. Unfortunately, STEM(H) renders the analysis untenable:

Table 2-31: STEM(H) enforces the displacement of H from the ending to the last syllable of the root

	H RR E	*LINK	MAX(T)	DEP(T)	STEM (H)	ALIGN-L (H, Source)	ALIGN-R (H, stem)
a	ŔRE	*				*	*!
b	☞RŔE	*				*	
c	☹RRÉ	*			*!		*

Apparently, the grammar requires a more principled way of preventing tone from shifting from its source morpheme. AVOID-SOURCE – a constraint that favours the realization of tone on segments other than the one to which it is linked in the input is proposed by Akinlabi and Mutaka (2001). The NOFLOP constraint proposed by Alderete (1999) is the exact opposite: it requires features to be realized on the same segments as in the input. However, neither constraint applies to floating input tones, as they are not linked to a specific segment. Revithiadou (1999) proposed a more general constraint *DOMAIN, which militates against the realization of features on their source morphemes. Clearly, what we need is its opposite: a constraint that prefers features to be outputted on the string corresponding to their source morpheme. Let us label the constraint TRUE-TO-SOURCE:

TRUE-TO-SOURCE – An input tone sponsored by a morpheme must be realized on the output string corresponding to that morpheme.

Note that this constraint is not equivalent to a set of alignment constraints requiring that the left/right edge of tone be aligned with, correspondingly, the left/right edge of the source morpheme, since it is not violated by tone docking on a non-boundary syllable of a polysyllabic morpheme. As we have mentioned on various occasions, in our analysis of Belarusian, we assume that tone is always realized on its source. [25] In terms of constraint ranking, TRUE-TO-SOURCE is therefore undominated. In the tableau below, we reanalyze forms composed of a toneless root and an ending that sponsors a floating tone.

[25] *Cf.* Zec's (1999, p. 230) remark that tone in Neo-Štokavian Serbian 'is preferably realised within the morphological constituent in which it originates.'

Table 2-32: Final analysis of the singular forms of pattern B and pattern D nouns

	H RR E	TRUE-TO-SOURCE	*LINK	MAX(T)	STEM(H)	ALIGN-L (H, Source)	ALIGN-R (H, stem)
a	ŔRE	*!	*			*	*
b	RŔE	*!	*			*	
c	☞RRÉ		*		*		*

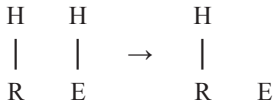
2.4.2.5 A summary of the tonal analysis of the accentuation of non-derived nouns

We are ready to present an overview of the representations and processing solutions we have proposed to account for the major accentual classes of Belarusian non-derived nouns (Classes A – D).

Masculine Class A nouns

a) singular

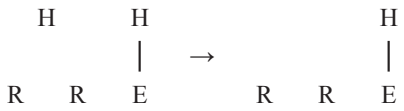
b) plural



Masculine Class C nouns

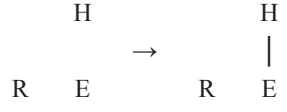
a) singular

b) plural

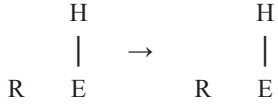


Masculine Class B nouns

a) singular

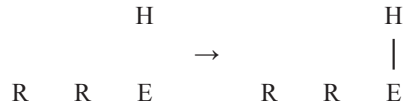


b) plural



Feminine (a-stem) Class D nouns

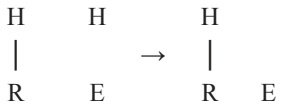
a) singular



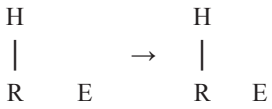
b) plural

Feminine (a-stem) Class A nouns

a) singular



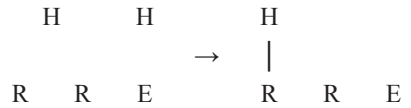
b) plural



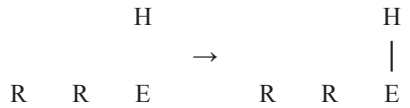
The model allows for a coherent and straightforward account of the accentuation of non-derived masculine and feminine nouns. Now let us apply it to neuter nouns. They follow one of the three accentual patterns: A, C, or D. The analysis of Class A nouns presents no difficulty, therefore we pass directly to patterns C and D. We propose that the roots of neuter Class C nouns contain a floating H and the roots of neuter Class D nouns are toneless (just like masculine Class C nouns and feminine Class D nouns correspondingly). The singular endings of neuter nouns contain a floating H, as in the illustration below.

Figure 2-14: Input-output mapping of singular neuter nouns

a) singular Class C



b) singular Class D



The analysis is identical with the analysis of the singular forms of masculine Class C and feminine Class D nouns correspondingly.

As far as the accentuation of the plurals is concerned, it is easy to see that no single representation of the plural endings is satisfactory. Suppose that the endings contain a floating tone. Then our model predicts that Class C plurals will be stressed on the initial

syllable just like the respective singular forms, and Class D plurals will be stressed on the endings – neither of which is true. If the endings contain a pre-linked H, then both Class C and Class D plurals will be stressed on the endings, which, again, is false. Toneless endings would incorrectly result in the initial stress in Class C plurals. We are forced to conclude that there are two series of plural neuter endings: one containing a pre-linked H and the other containing no tonal specification. The distribution of the two series of endings is predictable: toneless roots take toneless endings, and roots containing an H in the input take endings that contain a pre-linked H. Put differently, neuter Class D nouns take the feminine series of plural endings and neuter Class C nouns take the masculine series. It should be mentioned here that the number of Belarusian neuter nouns that follow the accentual pattern C hardly exceeds one dozen.

We are ready to present an overview of the properties of input representations and grammar in our model of the accentuation of Belarusian non-derived nouns. Inputs of roots and case endings can contain a pre-linked high tone, a floating high tone or be toneless. Various properties of the grammar corresponding to our model are listed below. We omit the attribution of constraints and their formal definitions. A broad list of OT constraints used in the analysis of tone can be found in Akinlabi & Mutaka (2001); an overview of OT treatment of a number tonal phenomena is presented in Yip (2002).

Every output must have one and only one instance of an associated tone. The relevant constraint is CULMINATIVITY – an output must have one and only one peak.[26] This constraint is undominated.

Tone can only be realized on its source morpheme. In the case of pre-linked tone sponsored by monosyllabic roots, this effect can be achieved by the appropriate ranking of the constraints against the delinking/linking of tone, *DELINK (*DISASSOCIATE) and *LINK (*ASSOCIATE). However, these constraints obviously cannot prevent a tone that lacks an association line in the input from shifting to a morpheme other than its source. Apparently, a more general constraint is called for: TRUE-TO-SOURCE – a tone must be realized on its source morpheme. The constraint is undominated in Belarusian.

If the input of a non-derived word is toneless, the grammar inserts an H and aligns it with the left edge of the stem. The insertion is possible thanks to the ranking

[26] Hyman (2006) argues that CULMINATIVITY ('do not have more than one peak') should be separated from OBLIGATORINESS ('have at least one peak'). For our purposes, this distinction does not have to be made.

CULMINATIVITY >> DEPT. The location of tone is determined by the alignment constraint ALIGN-R (align the right edge of H with the right edge of the stem).[27]

If an input contains a single pre-linked H, it is processed faithfully and outputted at the same location as in the input. No tone displacement is allowed in order to satisfy alignment constraints.

If an input contains a single floating H, it is outputted on the source morpheme and aligned with its left edge. The constraint requiring that tone be aligned with the left edge of its source must be ranked higher than the one requiring that tone be aligned with the right edged of the stem: ALIGN-L(SOURCE) >> ALIGN-R(STEM).

If an input contains two instances of H whose association status is identical (that is to say, both are pre-linked or both are floating), only the one sponsored by the root is outputted. Here the decisive role is played by the constraint STEM(H) – there must be a high tone on the stem.

If an input contains two instances of H, one of which is pre-linked and the other is floating, only the pre-linked one is outputted. Again, *DELINK plays a crucial role.

As our model does not assume any of the more 'advanced' tonal processes and phenomena (e.g. tone shifting, fusion, metathesis, floating tone in the output, etc.), the respective constraints – AVOID-SOURCE (*DOMAIN), NOFUSION, *FLOAT, LINEARITY and so forth – are either irrelevant or undominated.

2.5 Aspects of the accentuation of derived words

2.5.1 Preliminary remarks

Although the scope of our analysis is limited to non-derived nouns, we would like to briefly discuss how some phenomena observed in the accentuation of derived words

[27] To be more precise, the nucleus of the syllable to which H is linked in the output must be the rightmost nucleus of the stem. As we have explained in our review of previous work, the last consonant of the stem is generally parsed in the onset of the syllable formed by the first vowel of the inflectional ending. What this means, is that the right edge of the prominent syllable rarely coincides with the actual edge of the stem.

could be handled in our model. First, however, a few general remarks would not be amiss. One issue that has not received any consideration in the literature is whether the synchronic productivity of derivational suffixes should be taken into account when analyzing the accentuation of derived nouns. Melvold (1990) classifies one derivational suffix as dominant unaccented: words derived with this suffix are stressed on the initial syllable irrespective of the underlying accentual properties of the root. According to her, the suffix is completely unproductive; even more importantly, it is only used in the formation of a couple of nouns. Now, should a successful alternative model of accentuation be able to derive the accentuation of these words? Should *any* generative model, for that matter?

The next issue we would like to raise is internal to Optimality Theory. In the study of Russian, it has been generally assumed that the accentuation of a derived word can be determined from the accentual properties encoded in the inputs of its constituent morphemes (Melvold, 1990; Revithiadou, 1999). Optimality Theory, however, employs not only input-output but also output-output correspondence. Much of Alderete's (1999) analysis of Russian is based on OO correspondences. In fact, he extends output-output analysis to word forms that are related morphologically but not derivationally, such as plural *versus* singular forms of nouns. Recall that he proposes that the singular number constitutes the OO base for plural forms (on the grounds that the plural is more marked than the singular). The shifting of stress across paradigms is then seen as resulting from output-output anti-faithfulness requirements. Simply put, if the output of a singular form is stressed on the root, the output of the respective plural form must be stressed on the ending, and *vice versa*. As we have pointed out in our review, this solution is untenable for the reason that, in Russian, Class C nouns show stress alternations within paradigms. This is especially clear in feminine a-stem nouns: *golo'va* 'head' Nom. Sg, *golo'vɨ* Gen. Sg, *'golovu* Acc. Sg, and in the plural: *'golovɨ* Nom. Pl., *go'lov* Gen. Sg, *'golovɨ* Acc. Pl., *golo'vam* Dat. Pl. Which form should be taken as the output-output base of which?

Because of intraparadigmatic stress alternations in Russian, the choice of the output-output base may also be problematic in the case of *bona fide* derived words whose derivational bases are non-derived. For example, non-derived masculine nouns with post-accenting roots are stressed on the ending; one could say that this is their immanent property. However, the nominative singular of such nouns lacks an overt ending, so the output is stressed on the root – unlike all the other case/number forms. Should OO correspondence be based on the nominative singular or on one of the other forms? Of

course, this question also applies to potential derivational bases like *golova* above. Depending on which case/number form one takes, the root[28] has three accentual variants in the output: *golov-*, *'golov-*, and *go'lov-*.

In what follows, we assume that the location of stress in a derived word is determined on the basis of the accentual properties of constituent morphemes and input-output correspondences, although occasionally we shall signal possibilities for output-output analysis.

2.5.2 Accentual dominance and recessiveness

You will recall from our review of the literature on Russian stress that some derivational suffixes attract stress irrespective of the accentual properties of the root and other suffixes that may be located to their left. Such suffixes are traditionally referred to as ***dominant***, while suffixes which lack this property are called ***recessive***. Below we shall demonstrate that this classification of suffixes is relevant for Belarusian, too.

Belarusian adjectives can form diminutives[29] by means of the suffix *-en^{j}k-*, as shown in the table below. All the bases and derived adjectives are presented in the masculine nominative singular form. Note that stress in both groups of adjectives is fixed (that is to say, all gender/case/number forms of any given adjective are stressed on the same syllable). In the base adjectives, stress is fixed either on the root or on the inflection; in the diminutives, it is fixed either on the root or on the diminutive suffix.

Table 2-33: The accentuation of base adjectives and diminutives formed with the suffix *-en^{j}k-*

Base adjective	Diminutive adjective	Gloss
ma'ɬ-ɨ	ma'ɬ^{j}-en^{j}k^{j}-i	small
dur-'n-ɨ	dur-'n^{j}-en^{j}k^{j}-i	stupid
sta'r-ɨ	sta'r-en^{j}k^{j}-i	old
mała'd-ɨ	mała'dz^{j}-en^{j}k^{j}-i	young

[28] Here Alderete's notion of 'the shared stem' is tantamount to the root.

[29] We employ the term 'diminutive' for the lack of a better word; adjectives formed with this suffix are often emotionally tinted, with a suggestion of endearment, so that *ʦ^{j}opɬ^{j}en^{j}kaja pas^{j}ʦ^{j}el^{j}* '(a) warm-diminutive bed' means something like 'a nice warm bed' rather than 'a warm little bed.'

Base adjective	Diminutive adjective	Gloss
'słab-ɨ	'słabʲ-enʲkʲ-i	weak[30]
'tsʲixʲ-i	'tsʲixʲ-enʲkʲ-i	quiet
'dobr-ɨ	'dobr-anʲkʲ-i[31]	good, kind-hearted
'tsjopł-ɨ	'tsʲopłʲ-enʲkʲ-i	warm
ru'ž-oʊ-ɨ	ru'ž-oʊʲ-enʲkʲ-i	pink, rosy

It is easy to see that if the derivational base is stressed on the stem, then the respective diminutive form preserves the original location of stress. If, however, the base adjective is stressed on the ending, the diminutive form is stressed on the suffix *-enʲk-*. In terms of Melvold's (1990) model, the diminutive suffix can be analyzed as ***recessive accented***. If the root/stem of the base adjective[32] is underlyingly accented, the suffixal accent is not realized, in conformity with the Basic Accentuation Principle. If the root/stem is unaccented, the diminutive form is stressed on the derivational suffix. Note that an output-output analysis is also possible: a diminutive adjective faithfully preserves the accentual status of that part of its stem which is shared with the base adjective (the shared stem – Alderete, 1999).

Here we would like to make a digression concerning the determination of the accentual properties of adjectival roots in Belarusian. Melvold (1990) determines the accentual properties of Russian adjectival roots on the basis of the accentuation of so-called short adjectives. In modern Standard Russian, short adjective are used as predicates: *on 'molod* 'he [is] young,' *ona molo'da* 'she [is] young.' Attributive positions are occupied by long adjectives: *molo'doj dub* '[a] young oak-tree,' *molo'daja sosna* '[a] young pine-tree' (in the first example, the long adjective is masculine, in the second example it is feminine). Stress in all long adjectives is fixed. In short adjectives, stress may alternate, as can be seen in the above example *'molod* 'young' masc. versus *molo'da* 'young' fem., where the alternation is between the first syllable of the root (in the masculine) and the ending (in the feminine). Under Melvold's (1990) analysis, the root

[30] The alternative accentual variants of both the base and the diminutive are *sła'bɨ* and *sła'bʲenʲkʲi* correspondingly.

[31] The suffix vowel /a/ here is a result of the neutralization of /e/ in unstressed syllables after non-palatalized consonants; in Standard Belarusian, this kind of neutralization is obligatory in native words.

[32] The base adjective *ru'žovɨ* is obviously derived (cf. *'ruža* 'rose'); the root of *dur'nɨ* is *dur-*, as seen in other related words, e.g. *du'ritsʲ* 'to deceive/intoxicate.'

molod- is underlyingly unaccented, and the feminine ending *-a* is accented. She shows that Russian adjectival roots can be accented, unaccented or post-accenting, just like nominal roots.

In Belarusian, the predicative use of short adjectives is mostly limited to folk poetry, proverbs, and so on.[33] In regular speech, predicates are expressed by means of long adjectives: *jon 'mily* 'he [is] nice,' *jana 'milaja* 'she [is] nice,' *jany 'milyja* 'they [are] nice,' compare the Russian *on 'mil*, *ona mi'la*, *oni mi'ly* correspondingly. It is not clear whether and to what extent the original distinction between unaccented, post-accenting and accented adjectival roots is still relevant and recoverable in Belarusian.

We have applied Melvold's method of determining the accentual class of adjectival roots to the Russian cognates of the Belarusian adjectives in the preceding table. Somewhat surprisingly, almost all of them belong to the same accentual class C (*mal-* 'small' is pattern B, *star-* 'old' and *tepl-* 'warm' vary between patterns B and C, the derived adjective *'rozov-* 'pink' is class A). If one assumes, for the sake of argument, that the corresponding Belarusian roots have the same accentual properties as their Russian cognates, then the accentuation of the diminutives derived with the suffix *-en^{j}k-* can only be analyzed through output-output correspondence between long adjectives and diminutives.

Of course, there is no *a priori* reason why the accentual properties of adjectival roots in Belarusian would have to be the same as those of their Russian cognates. Given the fact that evidence from short adjectives is rarely, if at all, available to learners of Belarusian, hypotheses concerning the accentual properties of adjectival roots/stems have to be based on long adjectives or perhaps on deadjectival derived words. We propose that any root/stem which is stressed in a long adjective is stored as underlyingly accented; all the other adjectival roots/stems are unaccented. Thus, the root of the long masculine adjective *'dobrɨ* in Belarusian would be analyzed as accented, whereas its Russian counterpart is unaccented, as evidenced by the respective short adjectives: *'dobr*, *do'bra*, *'dobro*, *'dobry*/*do'bry* (masc. Sg, fem, Sg, neuter Sg, plural).

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[33] The use of short adjectives and short forms of other adjectival categories (especially, past passive participles) in predicate positions was not uncommon in formal style during the Soviet period – probably under the influence of Russian.

Our next piece of data involves the suffix *-avat-* used to form deadjectival and, occasionally, denominal adjectives. The suffix attenuates the quality signified by the adjective, very much like the English *-ish* (as in 'whitish'). In the table below, we present adjectives formed with this suffix on some of the same derivational bases as the diminutive adjectives from Table 2-33 above.

Table 2-34: The accentuation of adjectives formed with the suffix *-avat-*

Base adjective	Derived adjective	Gloss
ma'ɬ-ɨ	mał-a'ʊat-ɨ	smallish
dur-'n-ɨ	dur-n-a'ʊat-ɨ	somewhat stupid
sta'r-ɨ	star-a'ʊat-ɨ	oldish
'słab-ɨ	słab-a'ʊat-ɨ	rather weak
'ʦʲixʲ-i	ʦʲix-a'ʊat-ɨ	rather quiet
'ʦjopł-ɨ	ʦʲepł-a'ʊat-ɨ	warmish
ru'ž-oʊ-ɨ	ruž-a'ʊat-ɨ	pinkish[34]

As we see, adjectives formed with the suffix *-avat-* are always stressed on the suffix, so there is no correlation between the accentuation of a derived adjective and its derivational base. In terms of Melvold's (1990) model, *-avat-* is a dominant accented suffix.

Melvold (1990) and Alderete (1999) see dominance as a diacritic property of certain suffixes. Revithiadou (1999) proposes a more principled approach. According to her, the morphological head of a given word is processed more faithfully than other morphemes. The morphological head of a non-derived noun is its root. Correspondingly, if both the root and an inflectional ending contain an accent in their respective inputs, the root accent will prevail. If a derived word contains a category-changing suffix, this suffix is the morphological head of this word. An input accent sponsored by such a suffix will prevail over all the other input accents, even those sponsored by the root. For example, the word *ka'muna* 'commune' has a fixed root stress in Belarusian, so the root *kamun-* must be analyzed as containing an underlying accent. The word *kamu'nʲist* 'Communist' n, masc. is stressed on the derivational suffix *-ist*. The analysis is that both the suffix and

[34] Although standard grammars generally consider suffix *-avat-* as simplex, this form could indicate that it actually consists of two suffixes: *-ov* and *-at*, the *-ov* part being realized with an /a/ due to neutralization.

the root are underlyingly accented. The suffix is category-changing and is therefore the morphological head of the derived word. Correspondingly, the suffixal accent is outputted, and the root accent is deleted. If a word contains only suffixes that are not category-changing, then its root is the morphological head. The analysis based on morphological headedness can successfully account for the accentuation of Belarusian diminutive adjectives described above. Because the suffix *-en^{j}k-* is evaluative (and therefore not category-changing), its input accent surfaces only when the morphological head (the stem) has no accent in the input: *ma'l^{j}en^{j}k^{j}i* but *'dobran^{j}k^{j}i*. However, this analysis fails in the case of adjectives derived with the suffix *-avat-*. Although the suffix is evaluative and therefore does not constitute the morphological head of the respective derived words, it is always stressed. The analysis of dominance as faithfulness to morphological heads has to be rejected.

One interesting result of Revithiadou's (1999) analysis is that it captures the following relationship: an accented root is to a recessive accented suffix as a dominant suffix is to an accented root. In other words, accented roots are 'dominant' with respect to recessive suffixes but 'recessive' with respect to dominant suffixes. Our model can capture the similarity between accented roots and dominant accented suffixes. Recall that we represent accented roots as containing a pre-linked H in the input. We propose that the inputs of dominant suffixes also contain a pre-linked tone. Recessive accented suffixes contain a floating H in the input.

In the ensuing discussion, we generally take Melvold's (1990) analysis of Russian as the one that our model should be able to 'mimic.' The reason for this is that the existing work on the accentuation of derived words in Belarusian is scanty and fragmentary. Given that Russian is a closely related system, one can justifiably expect that there will be at least general similarities in the principles underlying the accentuation of derived words in the two languages. One such common property, as we have demonstrated above, is the distinction between dominant and recessive suffixes.

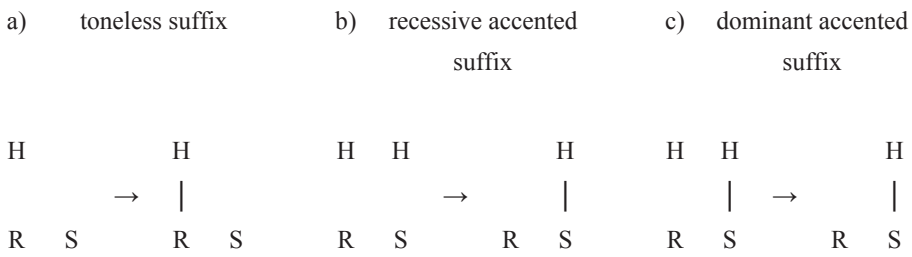
We begin with considering stems built on the roots of Class C nouns. Recall that Melvold (1990) analyzes such roots as unaccented. If a stem built on an unaccented root contains an accented suffix, the stem is stressed on the suffix. If the suffix is unaccented, the stem is stressed on the first syllable of the root:

Table 2-35: Location of stress in derived words built on Class C roots

Root	Suffix	Location of stress
unaccented	unaccented	first syllable of the root
	recessive accented	suffix
	dominant accented	suffix

In our model, Class C roots are represented as containing a floating high tone in the input. Unaccented suffixes are toneless, recessive accented suffixes contain a floating H, dominant accented suffixes contain a pre-linked H. Let us see how our representations tally with Melvold's analysis.

Figure 2-15: Input-output mapping of derived stems based on Class C roots



In a), the single floating tone present in the input gets associated to its sponsor at the left edge in satisfaction of ALIGN-L(SOURCE). In b), the input contains two instances of H, both of them floating. The realization of either of them in the output satisfies ALIGN-L(SOURCE), so the choice is made by the lower-ranked constraint ALIGN-R(STEM). The pre-linked instance of H in c) is outputted in preference to its floating counterpart thanks to *DELINK.

Next, we consider derived stems constructed on Class A roots. Melvold (1990) analyzes the roots as accented. If an unaccented or a recessive accented suffix is added, the stress remains on the accented vowel of the root. If a dominant accented suffix is added, the resulting derived word is stressed on the suffix.

Table 2-36: Location of stress in derived words built on Class A roots

Root	Suffix	Location of stress
accented	unaccented	root
	recessive accented	root
	dominant accented	suffix

Our model represents Melvold's accented roots as containing a pre-linked H:

Figure 2-16: Input-output mapping of derived stems based on Class A roots

a)	toneless suffix					b)	recessive accented suffix					c)	dominant accented suffix				
H			H			H	H		H			H	H			H	
|		→	|			|		→	|			|		→		|	
R	S		R	S		R	S		R	S		R	S		R	S	

In a) and b), the pre-linked feature H sponsored by the root is outputted faithfully, as the input contains no other instances of associated tone. In c), the situation is more complicated, as the grammar has to choose between two instances of associated H. The choice is made by ALINGR(STEM) in favour of the high tone sponsored by the suffix.

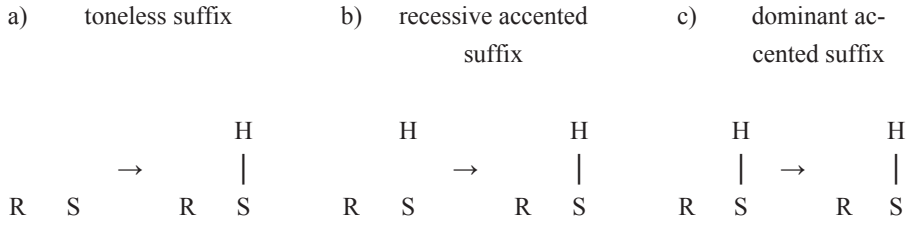
Next, we move to stems built on post-accenting (Class B) roots. Melvold (1990) represents such roots as accented on the last vowel and marked for the triggering of post-accentuation before inflectional endings (alternatively, the environment for the application of post-accentuation is defined as the penultimate syllable). The prediction of this analysis is that, in derived words, stress will be assigned to the last syllable of the root, if the derivational suffix is recessive. If the suffix is dominant, stress is assigned to the suffix.

Table 2-37: Location of stress in derived words built on Class B roots

Root	Suffix	Location of stress
post-accenting	unaccented	last syllable of the root
	recessive accented	last syllable of the root
	dominant accented	suffix

So far, our model has been able to successfully replicate Melvold's analysis. This time, however, our model predicts a different accentual behaviour. Recall that, in our account of the accentuation of non-derived nouns, we propose that post-accenting roots are toneless. Correspondingly, our grammar will assign stress to the suffix whenever a derived word is built on a Class B root, as demonstrated below:

Figure 2-17: Input-output mapping of derived stems based on Class B roots



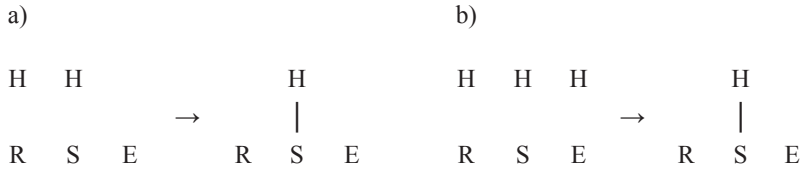
The only case where the two models converge is c), where the derived stem is formed by the use of a dominant suffix. In a), both the root and the suffix are toneless in the input. If we abstract away from the possibility that outputs may be affected by the accentual properties of inflectional endings, then the grammar inserts an H on the toneless stem and aligns the tone with the stem's right edge. In b), the grammar links the floating H to its sponsoring morpheme (the suffix). That is to say, our model predicts that all derived words built on post-accenting roots will be stressed on the suffix, whereas Melvold's model says that the location of stress in such words depends on whether the derivational suffix is dominant or recessive. Let us point out that this discrepancy is by no means unique to our model. Revithiadou (1999) presents several valid examples which contradict Melvold's generalization that a word formed from a post-accenting root with a recessive derivational suffix is stressed on the last syllable of the root. Revithiadou's own analysis seems to be convergent with the predictions of our model. Halle's (1997) representation of post-accenting roots also predicts post-root accentuation of derived words built on such roots. Recall that he represents post-accenting roots as containing a left bracket after the last segment of the root. In the presence of vocalic material after the root, the head foot is built on the syllable directly following a post-accenting root.

2.5.3 Residual issues

As we see have demonstrated in the previous section, our model can successfully account for most of the accentual types of derived stems as described by Melvold (1990). An important advantage of our model is that accentual dominance is no longer analyzed as a diacritic property. In Melvold's analysis, an accented root realizes its underlying accent at the expense of recessive suffixes thanks to the Basic Accentuation Principle (assign stress to the first underlyingly accented vowel). A dominant accented suffix realizes its accent at the expense of accented roots thanks to being diacritically marked as triggering the deletion of metrical structure to its left.[35] In our model, accented roots are just as 'dominant' as dominant suffixes: they have identical accentual representations and neither of them is diacritically marked.

When comparing the predictions made by our model with Melvold's analysis of derived words, we assumed that the accentuation of derived words is not influenced by the accentual properties of inflectional endings. In Melvold's model, this is a direct consequence of cyclicity: by the time an ending is concatenated to a derived stem, stress has already been assigned. In most cases, our model can handle the irrelevance of inflectional endings for the accentuation of derived words without any additional stipulations.[36] Thus, if a stem contains a pre-linked H, it will always be outputted in preference to any inflectional ending thanks to the requirement that there be an H associated to the stem: STEM(H). Stems containing a floating instance of H will also 'win over' inflectional endings in most cases. Consider the following scheme of an inflected noun derived from a Class C root by means of a recessive accented suffix:

Figure 2-18: Input-output mapping of an inflected derived word built on a Class C root



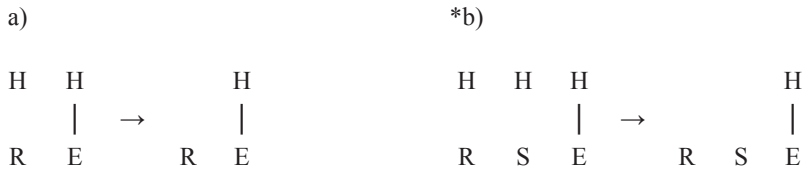
[35] Of course, these are just very informal restatements of the original analysis.

[36] The cyclic effect can be captured if one allows levels in OT, as Rubach (1997, *inter alia*) and Kiparsky (2010b) do. As we have explained elsewhere, our objective is to build a model directly comparable to the competing OT analyses presented in Alderete (1999) and Revithiadou (1999), both of which assume single-level versions of OT.

In a), the inflectional ending is toneless. In b), it contains a floating H. The suffixal instance of H prevails over all the other instances of the feature thanks to its alignment with the right edge of the stem.

However, in our analysis of the accentual pattern C, we proposed that masculine plural endings contain a pre-linked H. As will become evident from the scheme below, additional stipulations are required to ensure that this inflectional instance of H is not outputted in preference to those sponsored by the stem.

Figure 2-19: Incompatibility of the analyses of plural forms of non-derived (a) and derived (b) masculine nouns



The scheme in a) corresponds to the accentuation of the plural form of a non-derived masculine Class C noun. The inflectional ending realizes its H thanks to the ban on the deletion of association lines: in our grammar, it is 'cheaper' to delete a floating tone than an association line. By the same token, however, plurals of derived masculine nouns composed of a Class C root and a recessive suffix should be stressed on the ending, as in b). This is not the case: stress is fixed on the stem both in the singular and in the plural.

In view of the above, we propose that, apart from the general markedness constraint STEM(H) there is a more specific constraint DERIVEDSTEM(H): a stem composed of at least two morphemes must be linked to a high tone. Unlike the more general constraint STEM(H), DERIVEDSTEM(H) must be ranked higher than *DELINK, so that not only floating but also pre-linked instances of H sponsored by inflectional endings would not have a chance to surface, whatever the accentual properties of the constituent morphemes of the respective stems might be. Now our model can account for the accentuation of the majority of derived words through forcing tone to be outputted on derived stems rather than inflectional endings. This is, however, where the real problem comes: derived words with inflectional stress ***do*** exist and, in fact, they constitute quite a noticeable fraction of derived masculine nouns. All such words are formed with another group of dominant suffixes: post-accenting dominant suffixes. When such a suffix

occupies the final position in the stem, stress is assigned to the inflectional ending, if any. In the absence of an ending, the suffix itself is stressed.

In Melvold's (1999) analysis, post-accenting suffixes are diacritically marked as dominant accented and, in addition, as triggering post-accentuation in the penultimate position (in practice, before inflectional endings). Revithiadou (1999) proposes that post-accenting morphemes contain a floating strong accent in the input; the accent is outputted on the neighbouring morpheme due to the constraint against its realization on the source morpheme (*DOMAIN). Dominant post-accenting suffixes are category-changing suffixes with a floating accent in the input. The two analyses of post-accentuation make different predictions about the accentual behaviour of post-accenting morphemes in derived contexts. Melvold's model means that post-accenting roots will behave just like regular accented roots; that is to say, if such a root is followed by a recessive derivational suffix, stress will be assigned to the root. In Revithiadou's model, stress in a stem composed of a post-accenting root and an unaccented or non-category-changing accented suffix will be assigned to the suffix. In Alderete's (1999) model, post-accenting morphemes are unaccented in the input. Given his assumption that stress is assigned by default to the post-stem position, a non-derived noun composed of an unaccented (according to his model) root and an ending, will always be stressed on the ending. If no overt ending is present, the best way to satisfy the post-stem default is to assign stress to the last syllable. In his model, dominant post-accenting suffixes are also unaccented. By triggering output-output anti-faithfulness to the shared stem, they ensure that the original accent of the derivational base is not preserved. Now the entire derived stem is unaccented, and stress is assigned to the post-stem position. Frazier (2006) proposes that post-accenting morphemes trigger a special stress alignment constraint subcategorized for some morphemes.

As we see, there is not much of a consensus with respect to the representation and analysis of post-accentuation. From the point of view of our model, Melvold's analysis is perhaps the most attractive one, because there dominant post-accenting suffixes are seen as an exceptional group of dominant accented suffixes. What this means in terms of our representations, is that dominant post-accenting suffixes, just like dominant accented ones, must have a pre-linked H in the input. Post-accentuation then could be achieved e.g. through a morpheme-specific rightward tone shift.

One interesting property of post-accenting suffixes is that they are all dominant. Let us show that Melvold's (1990) model allows for the existence of recessive post-accenting suffixes. Consider a sequence RŚ$_p$E, where R is an unaccented root, Ś$_p$ is a recessive post-accenting suffix, and E is an inflectional ending. Because the root is unaccented, stress is assigned to the accented suffix and subsequently shifted to the ending by post-accentuation. Now consider a similar sequence ŔŚ$_p$E, where the root is underlyingly accented. The resulting form will be stressed on the root under the Basic Accentuation Principle. The distribution of stress in derived words formed with a hypothetical recessive post-accenting suffix would be as follows: if the root is accented (Class A or B), then the derived word is stressed on the accented vowel of the root; if the root is unaccented (Class C), then the word is stressed on the inflectional ending, if any. In the absence of an ending, stress is assigned to the suffix. In fact, no derivational suffix in Russian shows this kind of accentual behaviour. Melvold's model cannot possibly offer any principled explanation of this gap.

In our model, 'recessive' and 'dominant' accented suffixes are differentiated at the level of input representation: the former contain a floating tone, the latter contain a pre-linked tone. Let us assume that post-accentuation is a suffix-specific requirement to perform a local rightward shift of tone. As OT cannot impose limitations on inputs, such a requirement can in principle be imposed on any suffix that contains tone, irrespective of the tone's association status. It seems that the grammar must be able to block the shifting of underlyingly floating tones while allowing pre-linked tones to locally shift to the right. Such a grammar would account for the lack of recessive post-accenting suffixes.

Most dominant post-accenting suffixes form masculine nouns. The accentual behaviour of such nouns is identical to that of non-derived Class B nouns: they are stressed on the ending, if any, both in the singular and in the plural, as in the following Belarusian noun derived with the suffix *-un*: *kri'kun* 'bawler, shouter' Nom Sg, *kriku'na* Gen. Sg, *kriku'ni* Nom. Pl., *kriku'now* Gen. Pl., and so on. Some dominant post-accenting suffixes form feminine nouns. Rather intriguingly, the corresponding derived words are not stressed on the ending in both numbers. Instead, they follow the accentual pattern D of non-derived feminine nouns. Inflections are only stressed in the singular, whereas in the plural stress is assigned to the last syllable of the stem, as in the following Belarusian nouns formed with the suffix *-ot* (*-at* when unstressed): *kʲisła'ta* 'acid' Nom. Sg, *kʲisła'ti* Gen. Sg, but *kʲis'łoti* Nom. Pl., *kʲis'łotami* Instr. Pl., and so on. The base adjective *'kʲisłi* is

stressed on the root. In Melvold's model, derivational suffixes that trigger such behaviour have to be analyzed as dominant accented, marked as triggering post-accentuation and, in addition, marked as triggering retraction in the plural. Let us take a derived feminine noun whose stem is composed of an accented root and a dominant post-accenting suffix with retraction. In the course of the derivation of a plural form of such a noun, stress is first assigned to the root, then the newly-added dominant suffix 'wipes away' the existing metrical structure, after that stress is assigned to the suffix, next stress is shifted onto the inflection by the rule of post-accentuation, and finally it is retracted back onto the suffix by the rule of plural retraction. The analysis is quite complex even for a rule-based model.

To reiterate, nouns derived with dominant post-accenting suffixes are stressed exactly like non-derived masculine Class B or feminine Class D nouns. Recall that we represent the roots of non-derived Class B and Class D nouns as toneless. When the inflection is also toneless, a high tone is inserted by the grammar and aligned with the right edge of the root (this situation corresponds to the root-final stress of Class D plurals). If the inflection has a high tone in the input, it is faithfully outputted, and the resulting form is stressed on the ending (masculine Class B nouns and the singular of feminine Class D nouns). Suppose that the same mechanisms are responsible for the accentuation of derived nouns formed with dominant post-accenting suffixes. What this means is that the derived stems of such nouns 1) are toneless and 2) for the purpose of tone assignment, they are treated as bare roots and are not subject to the constraint DERIVEDSTEM(H). There is no obvious way of achieving this situation from within phonology. One possibility is that the deletion of all tones that may precede a post-accenting suffix happens as part of word formation; at the same time, morphology 'fuses' the entire stem together, so that it is no longer distinguishable from a bare root. The disadvantage of this solution is that morpheme boundaries inside the stem are no longer visible to any part of phonology. An alternative solution would be to posit that, as part of word formation involving a post-accenting suffix, the entire string preceding the suffix is rendered extratonal (extrametrical). As a result, the suffix would be the only part of the stem visible to tonal phonology, and the calculation of word prominence would proceed as if the stem was composed of a single morpheme.

2.6 In chase of the elusive East Slavic default

As we have mentioned elsewhere, experimental studies on the accentuation of nonce words by speakers of Russian (Crosswhite, et al., 2003; D'jačok, 2002) indicate that the preferred location of stress is at the right edge of the stem. This result is unexpected under most of the existing analyses of Russian stress, except for the brief outline in Crosswhite *et al.* (2003) based on Alderete's (1999) anti-faithfulness model.

Our analysis of Belarusian is largely compatible with the stem-final default. It prefers stems over inflections, and, within stems, an inserted accentual feature (or, as we suggest, high tone) is aligned with the right edge. Let us consider a nonce CVCVC string placed in a context that would allow a speaker to identify it as the nominative singular form of a masculine noun. Being a nonce form, it cannot conceivably have any stored accentual properties (in our terms, tone). In other words, it must necessarily be considered as underlyingly unaccented (toneless). Given our model, the grammar inserts an H on the toneless stem and aligns it with the right edge. The resulting word form is stressed on the last syllable.

There is, however, an important aspect of the accentuation of nonce words and borrowings that cannot be incorporated into our model just as easily. Consider a nonce CVCVCV string identifiable as a singular form of a feminine noun. Due to the inflectional nature of Russian, any such string must be interpreted as composed of the root/stem CVCVC- and the ending -V. Again, the root morpheme of the nonce form is unaccented (toneless) by definition. No such assumption can be made about the inflectional ending, though. In fact, in Melvold's analysis of Russian, as in most other analyses, the majority of the inflectional endings of feminine a-stem nouns are underlyingly accented. However, as far as we could infer from what Crosswhite *et al.* (2003) report, the preference for the stem-final stress in nonce words is not cancelled out by the presence of segments that can be perceived as inflectional endings. In terms of our model, any tone that may be present in the input of inflectional endings is disregarded, and the grammar inserts an H at the right edge of the toneless stem. The grammar we have developed for Belarusian does provide for such a process – but only if the stem consists of more than one morpheme. Of course, it is not impossible that some speakers analyze a nonce CVCVC- string as composed of two morphemes, especially as native East Slavic roots are generally of the CVC- form. However, words with evidently monomorphemic stems (CVC-V) are also stressed one the root.

There is another baffling conclusion that can be drawn from the fact that nonce CVCVCV words identifiable as singular forms of feminine nouns are stressed on the last syllable of the stem. The ***only*** accentual pattern that entails stem-final stress in the singular of Russian feminine nouns is the root-fixed pattern A. That is to say, nonce words behave as if their roots/stems were underlyingly accented on the last syllable. This observation is in conformity with the accentuation of borrowings (Mayer, 1976; Nikolaeva, 1971): they are generally adopted with a stress on the last syllable of the root/stem, but they are ***always*** adopted with a fixed stress (whatever the location).

We are facing a paradox: on the one hand, the roots/stems of nonce words and unfamiliar borrowings cannot possibly have any accentual specification in the input; on the other hand, under most of the existing analyses (including our own), their roots/stems must be analyzed as underlyingly accented. Apparently, the East Slavic default is not just to have a stem-final stress, it is to have a ***fixed*** stem-final stress.

That the accentual pattern A, where stress is fixed on the root, is the prevailing pattern in East Slavic, is nothing particularly new. It is true not only of derived words, which arguably can be expected,[37] but also of non-derived ones. Nevertheless, Melvold (1990), Halle (1997), Revithiadou (1999), and Alderete (1999) all analyze the roots of non-derived pattern A nouns as accented – that is to say, marked. Under all analyses based on the Basic Accentuation Principle, a non-derived noun consisting of an unmarked root and an unmarked ending is stressed by default on the first syllable. In other words, the corresponding accentual pattern C is the most unmarked one in terms of the representation and processing. However, in terms of prevalence, it is quite marked. In Belarusian, only about 20% of masculine nouns with monosyllabic roots[38] follow pattern C, whereas pattern A accounts for about 65% of such nouns. If assessed against the total number of nouns with monosyllabic roots (that is, including feminine and neuter nouns), the prevalence of pattern C drops below 8%, and the prevalence of pattern A exceeds 78% (calculated on the basis of data in Biryla, 1986). Patterns B, D, and various minor patterns jointly account for the remaining 14% of nouns with monosyllabic roots.

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[37] Melvold (1990) offers a principled explanation (formulated in the framework of cyclic phonology) of the fact that stress in derived words is almost unexceptionally fixed.

[38] Naturally, almost all such nouns are non-derived.

In terms of our model, the facts pertaining to the accentuation of nonce words could indicate that most non-derived pattern A nouns are built on unmarked (unaccented, toneless) roots. A 'rule' can be formulated to the extent that, whenever the root of a non-derived noun is toneless, the grammar inserts a high tone and aligns it with the right edge of the root. This rule alone would account for the accentuation of an absolute majority of non-derived nouns, as it covers all pattern A nouns with monosyllabic roots as well as those pattern A nouns whose polysyllabic roots are usually analyzed as accented on the last vowel. Moreover, this rule provides a synchronic explanation of the skewed distribution within the group of accented disyllabic roots: most of them are accented on the second vowel. The skew is a trivial consequence of the hypothesis that fixed stem-final stress is characteristic of unmarked roots. Those disyllabic roots which are usually analyzed as underlyingly accented on the first vowel can be represented as containing a pre-linked H on the root-initial vowel. The analysis of the accentual pattern C remains largely unchanged: the inputs of the respective roots contain a floating H.

The representational model sketched above leads to considerable redundancy. As we have just suggested, nouns with disyllabic roots with a pre-linked H on the first vowel will have a fixed root stress. What about nouns whose *monosyllabic* roots contain a pre-linked H? If they also exhibit a fixed root stress, then they are indistinguishable from nouns with toneless roots. The same goes for polysyllabic roots with a pre-linked H on the last vowel: are they just input variants of toneless polysyllabic roots?

Here we can fall back upon Melvold's (1990) concept of accented roots. Not every accented root corresponds to pattern A; some of such roots are additionally marked as post-accenting. Polysyllabic post-accenting roots are accented on the last vowel. Similarly, we propose that monosyllabic toneless roots and monosyllabic roots with a pre-linked H are, in fact, contrastive: the former correspond to a fixed root stress, the latter are post-accenting. Polysyllabic roots with a pre-linked H on any syllable but the last correspond to a fixed root stress; those with a root-final pre-linked H are post-accenting. Post accentuation now is seen as tone shifting (or perhaps spreading).[39] Tone displacement is only allowed in the following circumstances: the shifting/spreading tone must be pre-linked in the input to the last syllable of the root/stem. In a rule-base model, this can be expressed rather trivially: tone shifting is ordered before the insertion of tone on

[39] Spreading may be the preferred analysis, as will become clear after we have discussed the phonetic realization of word prominence in Belarusian.

toneless roots and before the association of underlyingly floating tone. Shifting is always rightward, strictly local, and can only occur at a morpheme (stem?) boundary.

The resulting model of the accentuation of Belarusian non-derived masculine nouns is as follows. Toneless roots correspond to a fixed root-final stress (most pattern A nouns). Roots with a floating tone correspond to pattern C. Roots with a pre-linked tone on the last (or the only) syllable correspond to pattern B. Roots with a pre-linked tone on any syllable but the last one correspond to a fixed non-root-final stress.

Given the above modifications, the analysis of the feminine accentual pattern D must also be changed. The previous proposal was that the roots and plural endings of such nouns are toneless, while the singular endings contain a floating H. The new analysis is again adopted from Melvold (1990). Under her analysis, the roots are post-accenting – so stress is shifted from the last syllable of the root to the endings. In the plural, stress is retracted back to the root by an additional rule of retraction. Translated into our model, the roots contain a pre-linked H on the last vowel. In the singular, the tone is shifted to the endings as expected; in the plural, the tone shift is blocked. The blocking can be effected by marking the respective feminine (but not masculine) plural endings as extratonal in the input. As most feminine plural endings are segmentally identical with their masculine counterparts in Reformed Standard Belarusian, [40] the analysis would involve morphology-triggered extratonality or perhaps allomorphy.

The new analysis of post-accentuation renders one very remarkable result. As we have mentioned before, all post-accenting suffixes in Russian are dominant, although there is nothing in Melvold's model that would preclude the existence of recessive post-accenting suffixes. In the revised tonal model, the 'dominance' of post-accenting morphemes follows from their very representation as containing a pre-linked H.

Dominant accented suffixes can conceivably be represented as unmarked (toneless) in the input. Now a derived stem formerly analyzed as composed of an accented root and

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[40] In our analysis of the accentuation of non-derived nouns, we have assumed that the plural endings of feminine and masculine nouns have different accentual properties despite predominant segmental identity. This assumption is not unfeasible in view of the fact that, in many dialects and in Unreformed Standard Belarusian, the series of masculine and feminine nouns are more distinct. The dative and locative plural endings are *-om* and *-ox* for masculine nouns, and *-am* and *-ax* for feminine nouns; the difference is neutralized only when the endings are unstressed. The segmental identity of the plural endings of masculine and feminine nouns in Standard Belarusian was introduced by the Communist language reform of 1934 as a copy of the Russian situation.

a dominant accented suffix can be represented as consisting of two unmarked morphemes. In this particular case, we do not even have to introduce any changes into the previously developed grammar: it will insert a high tone at the right edge of the toneless stem. However, in order to ensure that dominant suffixes are stressed after other types of roots (e.g. disyllabic roots with a pre-linked H on the initial vowel or roots with a floating H), the grammar should have to be considerably modified so that it would be able to insert a high tone on an unmarked suffix irrespective of whether or not the stem already contains an instance of H.

Earlier we suggested that recessive accented suffixes could be represented as containing a floating H in the input. Whether or not this representation is compatible with the proposals outlined in this section remains to be seen. As far as recessive unaccented suffixes are concerned, one possibility is to represent them as containing a low tone in the input (compare the notion of a 'weak accent' as used by Revithiadou). At this point, we shall not develop a detailed alternative analysis of the accentuation of derived words leaving it for further research.

3. The phonetic and phonological expression of stress in Belarusian

3.1 The phonetic cues to stress in Standard Belarusian

In the first comprehensive study of modern Belarusian dialects, Karskij (2006, originally published in 1908) described Belarusian stress as 'musical-expiratory.' This view is modified by Loban (1957, p. 192), who states that Belarusian stress is 'musical-expiratory or primarily expiratory.' Recent works abandon the view of Belarusian stress as musical-expiratory altogether. For example, Biryla (1986, p. 5) writes: 'Stress in Belarusian, like in many other Slavic and non-Slavic languages, is expiratory.'[1] The term 'musical' corresponds to the term 'pitch-accent' currently used in the literature to describe systems where word prominence is expressed by a pitch movement alone (e.g. Japanese) or by a pitch movement accompanied by stress (e.g. many dialects of Serbo-Croatian). Although Kryvicki (1959) and Vajtovič (1968) confirm the existence of isolated Belarusian dialects that mark word prominence by means of an obligatory pitch movement aligned with stress, the current view is that major Belarusian dialects and Standard Belarusian employ pitch movement for the purposes of intonation only.

Phonetic research conducted by Jakušaŭ at the beginning of the 1970s in order to determine the phonetic correlates of Belarusian stress showed that 'an increase in the amplitude of the stressed vowel (…) is not a constant characteristic of Belarusian word stress' (Martynaŭ & Padlužny, 1975, p. 13), whereas, at least in careful speech, 'the primary indicator of the location of word stress is vowel duration' (*op. cit.*, p. 53). Vyhonnaja (1991, p. 138) asserts that 'any correlation between the location of stress on the one hand and pitch or intensity on the other is only observed when the word is placed in a certain phrasal environment conducive to an increase in these parameters.' According to her, an analysis of words pronounced in isolation shows that stressed syllables do not necessarily exhibit a higher amplitude or intensity. The same applies to the fundamental frequency (in her terminology, fundamental tone).

[1] Translation from Belarusian here and elsewhere is ours – A.D.

Although Belarusian stress is regularly described as expiratory, Vyhonnaja (1991) admits that no research has been performed to ascertain whether Belarusian stress exhibits such signs of expiratory (dynamic) stress as 'an increased muscular tension of the organs of speech and stronger expiration,' so any statements to this effect are based on perceptual judgments only. She goes on to remark that the combined dynamic and durational nature of stress in Standard Belarusian 'seems obvious.' The *perception* of a stronger vocal effort and the apparent lack of an increase in overall intensity on stressed syllables do not necessarily contradict each other. Sluijter *et al*.(1997) report that an increase in *perceived* loudness can be due to 'the increased intensity levels in the higher part of the spectrum' rather than an increase in overall intensity; similar observations have been made in a number of earlier works, e.g. Glave & Rietveld (1975). Another factor than can influence the perceived loudness of a given signal could be its duration. Miller (1948) uses white noise[2] to study perceived loudness as a function of signal duration. He demonstrates that the perceived loudness of noise increases with the duration of the signal until maximum loudness is reached (starting from that moment, perceived loudness is not dependent on duration anymore).[3]

Whatever the reasons for the reported perception of a stronger vocal effort on Belarusian stressed syllables, the principal role of duration in stress cuing is typologically expected. Experiments on the perception of English stress reported by Fry (1955) show that, although duration and intensity are both cues for stress judgments, 'duration ratio is a more effective cue than intensity ratio.' Turk & Sawusch (1996) claim that length (perceived duration) and loudness are processed integrally (as a unit). However, they report that the relation between these two cues is asymmetrical: prominence judgments can be made on the basis of both length and loudness or on the basis of length alone – but not on the basis of loudness alone.

The generalization about the role of duration in the perception of Belarusian stress can be refined still further by specifying the role of vowel duration as opposed to syllable duration. Vyhonnaja (1991, p. 138) reports that, although consonants that belong to

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[2] That is, noise with a flat frequency spectrum.

[3] Of course, these results cannot be automatically applied to human speech. The nature of the stimulus (white noise) is very different from speech signals. Besides, the reported effect is only observed within certain durational limits. A 20 dB noise signal crosses the perception threshold at the duration of about 10 ms and reaches maximum loudness in 140 ms from the start of the signal. Vowel sounds of human speech can be considerably longer than that.

unstressed syllables are slightly shorter than their counterparts in stressed syllables, this phenomenon is 'irregular and not very significant.' Correspondingly, in subsequent discussion we treat vowel duration as the primary acoustic cue to stress in Belarusian. In terms of phonetic cuing, the language is therefore a 'duration-accent' system, to use the term coined by van der Hulst (2010). In addition, stressed syllables exhibit the full array of vocalic contrasts, while the ability of unstressed syllables to support such contrasts is limited, as we shall presently see.

3.2 On the special status of the immediately pretonic syllable in Belarusian

3.2.1 The durational differences between unstressed syllables

Andrèeŭ (1984) studies relative durations of stressed and unstressed vowels in Belarusian. On the basis of his results, he divides all unstressed positions into two categories according to the relative duration of the respective nuclei as measured against the duration of stressed vowels. The first group comprises the immediately pretonic position, word-final open syllables, and word-initial syllables that do not have an onset. Group 2 includes all the remaining unstressed positions (word-initial syllables with an onset, word-final closed syllables, and other unstressed syllables that do not immediately precede the stressed syllable). High vowels forming the nuclei of Group 1 syllables are 1.2 – 1.3 times shorter than the same vowels in stressed syllables, while high vowels in the nuclei of Group 2 syllables are 1.4-2 times shorter than their stressed counterparts. The duration of an unstressed vowel [a], as measured against the duration of a stressed [a], is 1.6-2 times lesser in Group 1 syllables and 2.2-2.4 times lesser in Group 2 syllables. We see that there is a significant durational difference between the two groups of unstressed syllables.

Of course, it is not unexpected that stressed vowels are the longest. Also the fact that the nuclei of word-initial onsetless syllables are longer than the nuclei of word-initial syllables that do have an onset is not surprising: word-initial vowel enhancement has been reported for other languages (see e.g. Cho, 2002; Lee, 2007). In English, reduced vowels preceding the stressed syllable can be deleted: [pə'li:s] or ['pli:s]; however, elision never applies to word-initial onsetless syllables: [ə'læskə] cannot be

pronounced as *['læskə]. In Russian, non-high vowels are generally realized as a schwa in unstressed syllables – but not if the syllable is immediately pretonic or word-initial and onsetless. In these positions, low vowels are neutralized as in any other unstressed syllable; however, they are only slightly reduced, never reaching a schwa-like quality. As far as vowels at the absolute word beginning are concerned, Crosswhite (2001) accounts for their failure to undergo considerable qualitative reduction by positing that vowels in this position are moraic. Their moraic status is due to an alignment constraint which requires that the left edge of every word be aligned with a mora; vowels reduced to schwa are presumably non-moraic. This solution, however, is not tenable for systems like Standard Belarusian, where low vowels are neutralized but not reduced in unstressed syllables: both /a/ and /ɔ/ in unstressed syllables are pronounced as a slightly reduced variant of [a] – but never as a schwa. Word-final lengthening of vowels in open syllables is also a familiar phenomenon (see e.g. Aasmäe, 2006; Lunden, 2006; Oller, 1973).

What is surprising about Andrèeŭ's findings is that, besides these two typologically expected environments at the word edges, longer duration characterizes unstressed vowels in the syllable directly preceding the stressed syllable. If anything, one would expect that this syllable should be one of the weakest in a given word: after all, in various other languages vowels in this position are more or less regularly subjected to extreme reduction or even elision (we have already mentioned the English ['pli:s], a not uncommon realization of the word *police*).

3.2.2 Vowel neutralization in Standard Belarusian

The longer duration of the immediately pretonic syllable becomes even more puzzling if one takes into account the facts of vowel neutralization in Belarusian. Let us briefly present the basic facts. Like most Slavic languages, Belarusian has an uncomplicated vowel inventory consisting of six (or five – see Footnote 4) vowels. There are three high vowels: the front /i/, the central /ɨ/[4], and the back /u/. Non-high vowels include the mid front [ɛ], the mid back [ɔ], and the low back [a]. High vowels undergo no neutralization and only a very limited qualitative and quantitative reduction in unstressed syllables.

[4] Researchers of Polish and Russian have often treated [ɨ] as an allophonic variant of /i/. We decided in favour of using a separate symbol for this vowel in order to facilitate the recognition of Belarusian tokens by readers familiar with Slavic, as both Cyrillic and Latin scripts of Belarusian have letters corresponding to this sound: *ы* in the Cyrillic script and *y* in the Latin script.

Non-high vowels, however, are regularly neutralized in unstressed syllables. According to Czekman & Smułkowa (1988), the three non-high vowels /ɛ /, /ɔ/, and /a/ are all realized as allophones of /a/ in unstressed syllables by most speakers of Standard Belarusian. For some speakers, however, the neutralization pattern is more complicated.

The mid back vowel /ɔ/ is indeed neutralized in all unstressed syllables, except word-finally in a very limited number of borrowings like ['radʲijɔ] 'radio.' As far as the mid front vowel /ɛ/ is concerned, the occurrence or non-occurrence of neutralization depends on a number of factors: whether the root of a given lexical item belongs to the native/nativized stock or not; whether the immediately preceding consonant is palatalized; finally, and most importantly for our discussion, whether the respective unstressed syllable directly precedes the stressed one. In the absolute majority of borrowings, /ɛ/ is not neutralized in any position within the borrowed root: [rɛ'daktar] 'editor', [tɛa'tralʲnʲi][5] 'theatrical', [lʲɛ'sɔta] 'Lesotho'. All non-palatalized consonants in Belarusian are velarized (Padlužny & Čèkman, 1973). The distinction between palatalized and velarized consonants is important in describing the neutralization of /ɛ/ in native vocabulary. After velarized consonants, /ɛ/ is always neutralized in unstressed syllables: ['rɛkʲi] 'river' Nom. Pl. *but* [ra'ka] 'river' Nom. Sg, [račnʲi'kʲi] 'river transport workers.' After palatalized consonants, /ɛ/ may retain its mid front quality in all syllables but the immediately pretonic one: [vʲɛča'rɔvʲɨ] *or* [vʲača'rɔvʲɨ] 'evening' adj., Masc. Nom. Sg; [lʲɛsavʲi'čɔk] or [lʲasavʲi'čɔk] 'wood goblin', Dim., Nom. Sg; ['ɣuškanʲ:ɛ] or ['ɣuškanʲ:a] 'swinging' n, Nom. Sg **but only** [mʲa'ži] 'boundary' n, Gen. Sg (that the first vowel is front underlyingly is shown by the form ['mʲɛžɨ] 'boundaries', Nom. Pl.).

The neutralization pattern described above closely corresponds to how vowel neutralization is reflected in the spelling. Given the fact that Belarusian dialects range from non-neutralizing to 'all-neutralizing' (we use this *ad hoc* term to refer to those dialects where neutralization occasionally applies even to high vowels), one would expect a certain level of tolerance regarding the degree, presence or absence of vowel neutralization . Indeed, the mid front vowel /ɛ/ may or may not be neutralized after palatalized consonants without any consequences for the assessment of a speaker's language proficiency. This, however, does not apply to the immediately pretonic syllable, where a failure to neutralize /ɛ/ in a native morpheme is regarded as unacceptable.

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[5] As before, we mark palatalization with the superscript [/j/].

Thus, the vocalic inventory of Belarusian is considerably reduced in the immediately pretonic syllable, where only high vowels and allophones of /a/ are allowed in native words or completely nativized borrowings. Often this kind of vowel neutralization (in the literature on Slavic, it is frequently misnamed 'vowel reduction') is explained away by stipulating that unstressed vowels cannot support the entire array of vocalic contrasts due to their purported weakness, and in particular, their shorter duration. However, as we have noted before, phonetic research has demonstrated that, in Belarusian, the immediately pretonic syllable is the second longest in a given word (if one disregards word-initial onsetless syllables and word-final open syllables). Therefore, there does not seem to be any obvious phonetic reason why this syllable should support the smallest number of vocalic contrasts. As Bethin (2006, p. 126) points out, 'the existence of lengthened neutralized or reduced vowels appears to contradict durationally based functional explanations of vowel neutralization /reduction.'

3.2.3 Belarusian vowel neutralization: why positional faithfulness fails

It is only recently that generative research on East Slavic stress turned its attention to the patterns of vowel neutralization in Belarusian and Russian and vowel reduction in Russian. Generally, studies of the Russian stress have focused on the computation of the location of the head syllable, leaving aside such stress-dependent phenomena as vowel neutralization and reduction. Relatively recent generative contributions to the study of these phenomena include Alderete (1995), Barnes (2006), Bethin (2006), Crosswhite (2001). All of these works pay some attention to the special status of the immediately pretonic syllable in East Slavic.[6]

Alderete (1995) approaches the special status of the immediately pretonic syllable *vis-à-vis* other unstressed syllables by positing that it is part of the binary iambic head foot formed by the stressed syllable. Iambic footing for Russian is also assumed in Halle and Vergnaud (1987) and Crosswhite (2001). Before we take a closer look at Alderete's analysis, some background information concerning vowel reduction in Russian will be helpful.

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[6] As in Standard Belarusian, the immediately pretonic vowel in Standard Russian is the second longest in a word. Moreover, in Russian, the immediately pretonic vowel may be as long as the stressed one or even longer when the word is in a weak phrasal position (Knjazev, 2006). Note that, like in Belarusian, the only reliable stress cue in Russian is duration. Knjazev (*op. cit.*, p. 50) jointly refers to the group constituted by the two syllables as 'the prosodic nucleus of a word.'

Underlying //ɔ// and //a// are neutralized in unstressed syllables. After non-palatalized consonants, they are pronounced as a full vowel resembling [ʌ] in the immediately pretonic syllable and at the absolute word beginning.[7] In other unstressed syllables, they are reduced to *schwa*. The following examples are adopted from Klepko (1964)[8]: karavaj - [kərʌ'vaj] 'round loaf', zalatatʲ - [zəłʌ'tatʲ] 'to patch up', tarakana - [tərʌ'kanə] 'cockroach' Gen. Sg, balagana - [bəłʌ'ganə] 'show-booth, low farce' Gen Sg, xorošɔ - [xərʌ'šɔ] 'well', potolok - [pətʌ'łɔk] 'ceiling', kolokol - ['kɔłəkəł] 'bell.' To sum up, /ɔ/, /a/ → [ʌ] after non-palatalized consonants in the immediately pretonic syllable and word-initially; /ɔ/, /a/ → [ə] after non-palatalized consonants in other unstressed syllables. Note that in many of the above cases of vowel neutralization and/or reduction, the original vowel quality is recoverable from other word forms. For example, the second vowel of [xərʌ'šɔ] is an //ɔ// in the input, as demonstrated by [xʌ'rɔš] masc. adj. 'good.' The final vowel of [tərʌ'kanə] is the genitive singular ending, whose original quality is recoverable under stress from other words: [u'ža] 'grass-snake' Gen. Sg. That is to say, the neutralization and reduction processes are undoubtedly synchronic, even though the original, etymological quality of a given vowel is not always recoverable. The first root vowel of [tərʌ'kanə] is always realized as a schwa; however, even if one assumes that the schwa is non-derived in this and similar cases,[9] the analysis is of no consequence for the synchronic status of the neutralization and reduction of non-high vowels in Russian.

In his analysis, Alderete (1995) employs the theory of vocalic contrasts developed in Selkirk (1991).[10] In this theory, /a/ and /ɔ/ share the specification [Phar<yngeal>]. While [Phar] is sufficient to specify /a/, the more complex vowel /ɔ/ requires the additional specification [Dor<sal>] to set it apart from low vowels, and [Lab<ial>] to distinguish it from front vowels. The *schwa* is represented as an empty vocalic root node. In terms of this representational model, the articulatory features of the Russian vowel /ɔ/, [Dor, Lab, Phar], are completely lost in all unstressed syllables except the immediately pretonic one. The articulatory feature [Phar] of the vowel /a/ is also lost in all the unstressed syllables but the pretonic one. As a result, both vowels surface as

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[7] After palatalized consonants, all unstressed vowels but /u/ tend to be realized as allophones of /i/.

[8] The word forms are cited in transliteration.

[9] Under the Richness of the Base, this may well be true at least for some speakers.

[10] According to Alderete, the vowel system of Russian is represented as follows: /a/ is [Phar], /u/ is [Dor, Lab], /i/ is [Dor, Cor], /ɔ/ is [Phar, Dor, Lab], and /ɛ/ is [Phar, Dor, Cor].

schwas.[11] In the immediately pretonic syllable, the vowel /ɔ/ retains part of its articulatory specification, namely the feature [Phar], which adequately specifies the vowel /a/. Correspondingly, both /ɔ/ and /a/ in the immediately pretonic syllable surface as an allophone of /a/.

Two markedness constraints are at play. One is a constraint against mid vowels, *MID,[12] the other is *[Phar], a constraint against the respective feature. In its application to the vowel /ɔ/, the constraint *MID bans the featural complex [Phar, Dor].[13] The two markedness constraints are ranked above the general feature identity constraint IDENT(F). What this ranking ultimately means is that the least marked output of an /ɔ/ or an /a/ is [ə] – the schwa. However, both vowels are outputted faithfully in stressed syllables. The featural identity of vowels in stressed syllables is protected by positional faithfulness: HEAD(σ)-IDENT(F) >> *MID, *[Phar].

The head-syllable identity constraint is one of the group of head identity constraints of the type HEAD(PROSODIC CATEGORY)-IDENT(F). As we have mentioned above, Alderete (1995) assumes that the immediately pretonic syllable is part of an iambic foot. Vowels in this head foot are protected by the head-foot identity constraint HEAD(FOOT)-IDENT(F). The fact that mid vowels lose part of their specification in the immediately pretonic syllable means that this constraint is ranked below *MID.[14] The retention of the feature [Phar] means that HEAD(FOOT)-IDENT(F) outranks *[Phar]. Now the ranking is as follows: HEAD(σ)-IDENT(F) >> *MID >> HEAD(FOOT)-IDENT(F) >> *[Phar] >> IDENT(F).[15]

Below we reproduce the pertinent tableau from Alderete (1995, p. 15). In the tableau, the deletion of each of the features [Dor] and [Phar] is interpreted as involving a separate violation of feature identity constraints. Thus, the reduction of /ɔ/ to [ə] incurs two violation marks under feature identity, whereas its neutralization to /a/ incurs one

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[11] Alderete does not address the behaviour of vowels in the absolute word-initial position; as we have noted above, they are not reduced to a *schwa*.

[12] In terms of articulatory features, this is a constraint against the feature complex [Phar, Dor].

[13] The feature [Lab] is factored out from the analysis, as it plays no role in the Russian neutralization.

[14] Alderete proposes that the pharyngeal feature is faithfully outputted thanks to a high-ranked IDENT[Phar] constraint.

[15] In the ranking presented in Alderete (1995:15), HEAD(FOOT)-IDENT(F) and *[Phar] seem to be unranked; however, it is explicitly stated on p. 14 that the head-foot identity outranks *[Phar].

such violation. The tableau, which presents the generation of *vodovoz* 'water-carrier,' is reproduced without any modifications. Note, in particular, that Alderete assumes that the second vowel of the input is an //a//.

Table 3-1. Russian vowel neutralization in *vodovoz*, after Alderete (1995)

input: vodavoz	HEAD(σ)-IDENT(F)	*MID	HEAD(F)-IDENT(F)	*[Phar]	IDENT(F)
vo(da'voz)		**!		***	
vo(da'vaz)	*!	*		***	
va(da'voz)				***!	*
və(də'voz)			*!		***
☞və(da'voz)				**	**

The word *vodovoz* contains two roots: vod- (cf. *voda* 'water') and -voz (cf. *vozit'* 'to carry') connected by a linking vowel. The vowel is usually assumed to be //ə//, as reflected in the spelling. If this is the case, then the second vowel of the optimal output [vədʌ'vɔs][16] does violate feature identity, contrary to what is shown in the tableau. However, even if we assume that the linking vowel is /a/, as Alderete seems to do, it is not clear why vo(da'vaz) is not marked for a violation of IDENT(F) but only for HEAD(σ)-IDENT(F). The form və(də'voz) incurs a violation of *[Phar] in the stressed syllable – however, no violation mark is present in the tableau. Similarly, the last three forms violate the constraint *MID in the stressed syllable – but the violations are not shown in the tableau. Nevertheless, it is easy to demonstrate that, after the mistakes are corrected, the tableau will generate the same optimal output. The choice between the two most optimal candidates is made by *[Phar]: va(da'voz) incurs more violations of *[Phar] than the optimal output və(da'voz). This is not to say, however, that there are no more problems left.

Below we present a modified version of Alderete's tableau. In this version, we omit the candidates that violate HEAD(σ)-IDENT(F), correct some mistakes and consider an additional candidate. For the sake of comparability, we take the same input form as

[16] The voiceless sibilant results from word-final devoicing.

Alderete, that is //vodavoz// rather than //vodovoz//. We also retain the mixed transliteration/transcription way of representing the outputs.

Table 3-2: Modified tableau generating the output of *vodovoz*

input: //vodavoz//		HEAD(σ)-IDENT(F)	*MID	HEAD(F)-IDENT(F)	*[Phar]	IDENT(F)
a	va(da'voz)		*		***!	*
b	və(də'voz)		*	*!	*	***
c	☞və(da'voz)		*		**	**
d	☞vu(da'voz)		*		**	**

In the last two candidates, *MID is satisfied by two different types of /ɔ/-reduction. In *c*, the reduction is complete: all the articulatory features [Phar, Dor, Lab] are deleted. In *d*, only [Phar] is deleted, and the vowel surfaces as [Dor, Lab], that is as [u]. The constraint system employed in the tableau does not suffice to choose between them. As mentioned in Footnote 13, Alderete is aware of this problematic aspect of the analysis. He proposes that the 'persistence of [Phar]' is due to a high-ranked identity constraint IDENT([Phar]) without specifying how this constraint would be ranked among the other constraints employed in the analysis. In the next tableau, we include the constraint IDENT([Phar]) at the lowest position.

Table 3-3: IDENT([Phar]) fails to choose between the most harmonic candidates

input: //vodavoz//		HEAD(σ)-IDENT(F)	*MID	HEAD(F)-IDENT(F)	*[Phar]	IDENT(F)	IDENT([Phar])
a	va(da'voz)		*		***!	*	
b	və(də'voz)		*	*!	*	***	**
c	☞və(da'voz)		*		**	**	*
d	☞vu(da'voz)		*		**	**	*

Irrespective of the ranking of IDENT([Phar]), it cannot influence the choice between the last two candidates because each of them involves only one violation of this constraint. It seems that the choice is ultimately made not by IDENT([Phar]) but by a constraint against [u], that is *[Dor, Lab]. The constraint is violated by the last candidate but not by the

optimal candidate. This is not the end of problems, though. In the following tableau, we present the mapping of *moloko* 'milk.' We add the constraint *[Dor, Lab] (represented as *[u]) at the lowest position. As no candidate violates HEAD(σ)-IDENT(F), we omit the constraint from the tableau.

Table 3-4: Preference for the neutralization to /u/

input: //moloko//		*MID	HEAD(F)-IDENT(F)	*[Phar]	IDENT(F)	IDENT ([Phar])	*[u]
a	mo(loko)	***!		***			
b	ma(lako)	*	*	***!	**		
c	mə(ləko)	*	**!	*	****	**	
d	☹ mə(lako)	*	*	**!	***	*	
e	💣mu(luko)	*	*	*	**	**	**
f	mu(lako)	*	*	**!	**	*	*

The grammar incorrectly designates the candidate *muluko* as optimal due to the fact that it satisfies the constraint *[Phar] better than the actual output [məɬʌ'kɔ] (represented as *məlako* in the tableau). The same result obtains if the feature [Lab] is assessed in the evaluation of feature identity, the difference being that this time the choice is made by HEAD(F)-IDENT(F). Indeed, if /o/ is represented as [Phar, Dor, Lab], then its reduction to [u], represented as [Dor, Lab], is more faithful to the input than its reduction to [ʌ], represented as [Phar]. If we try to re-rank the constraint *[u] so that it dominates *[Phar] or is ranked on par with *[Phar], it will dominate the general identity constraint IDENT(F). As a result, we should expect the neutralization of /u/ to *schwa* in unprotected positions. No such neutralization ever takes place in Standard Russian.

We shall not develop Alderete's (1995) analysis any further, as the elaboration of a complete grammar of the Russian neutralization is rather tangential to our purpose. All the inconclusive aspects of the analysis notwithstanding, we simply assume that it is possible to develop a grammar of Russian in which general markedness constraints favour the reduction of /a/ and /ɔ/ to *schwa* in all unstressed syllables, except for the immediately pretonic one, where they retain the specification [Phar] thanks to positional faithfulness.

Under the positional faithfulness analysis presented above, the reduction of /ɔ/ and /a/ to *schwa* is categorical: their articulatory features are deleted by the grammar. The pretonic neutralization of /ɔ/ and /a/, resulting in their output as [ʌ], is essentially an aborted reduction to schwa: the vowels retain part of their articulatory specification only thanks to their position in the head foot. There are indications, however, that the Russian vowel reduction and vowel neutralization may be two independent processes. Barnes (2007) reports on an interesting hyperarticulation experiment which demonstrates that, at slower speech rates, speakers of Russian decrease the degree of centralization or even entirely suppress the phonetic reduction (but not neutralization) of the output correspondents of //ɔ// and //a// and realize them as a full vowel of the /a/ quality. Interestingly, at no speech rate is the underlying contrast between //ɔ// and //a// recovered in unstressed syllables. If one accepts hyperarticulation as a valid experimental method, then, in view of the above results, one should consider the hypothesis that the Russian neutralization of /ɔ/ and /a/ is categorical (phonological), while the reduction to *schwa* is gradient and dependent on the tempo of speech (phonetic). In terms of Selkirk's (1991) system of representation, what happens in all unstressed syllables regardless of their position with respect to the stressed syllable is that phonology removes only the features [Dor] and [Lab] but not [Phar] from all the correspondents of an input //ɔ//; as a result, both //a// and //ɔ// are outputted as /a/ in all unstressed syllables. The ensuing centralization (reduction) of /a/ to [ʌ] or [ə] is not phonological but phonetic and tempo-dependent. To give an example, depending on the tempo of speech, //moloko// could be outputted as [məɬʌ'kɔ], [mʌɬʌ'kɔ] or even [mała'ko] – but never *[mɔłɔ'kɔ]. Arguably, under hyperarticulation, tempo-dependent effects are removed but not the results of phonological processing. If this is indeed so, then centralization, including the reduction to *schwa*, depends on temporal factors – in other words, on the duration of the respective syllables. Vowels in the immediately pretonic syllable are never reduced to schwa not because their featural identity is protected but because phonology enhances the duration of such syllables *vis-à-vis* the duration of other unstressed syllables. Under the positional faithfulness approach précised above, the durational differences between the immediately pretonic and other unstressed vowels must be seen, on the contrary, as a secondary phenomenon. Vowels in the immediately pretonic syllable are longer because they retain some articulatory features and remain 'full vowels.' The duration of a full vowel is intrinsically longer than that of the completely unmarked *schwa*.

Recall that, according to Andrèeŭ (1984), regular durational differences between vowels in the immediately pretonic position and their counterparts in other unstressed

syllables are not limited to those vowels that undergo neutralization. Neither /i/ nor /u/ are neutralized or reduced in Belarusian in any position. However, they are considerably longer when immediately pretonic than in other unstressed positions. Moreover, most researchers on Belarusian agree that there is little qualitative difference between neutralized vowels in the immediately pretonic syllable and those in other unstressed syllables. Similarly to Russian, //ɔ// and //a// are both realized as allophones of /a/ when unstressed. However, even in the weakest unstressed positions, allophones of /a/ are only slightly or moderately centralized, never reaching the central articulation of the *schwa*. In terms of Selkirk's (1991) representations, the mid back vowel /ɔ/, when unstressed, loses its [Dorsal] and [Labial] specifications, but never [Pharyngeal]. In fact, no Belarusian vowel can be completely devoid of featural specification, so the surface inventory lacks the unspecified vowel [ə] characteristic of the Russian or English vowel reduction. Correspondingly, the durational differentiation of unstressed vowels in Belarusian cannot be explained by the intrinsic durational difference between full vowels and the unspecified vowel [ə].

There is another property of the immediately pretonic syllable in Belarusian which does not easily lend itself to an explanation in terms of positional faithfulness. As we have mentioned earlier, for many speakers of Standard Belarusian, the immediately pretonic syllable is the site of maximum neutralization, as this is the only position where a failure to neutralize the mid front vowel /ɛ/ following a palatalized consonant in a native word is considered unacceptable. In all the other unstressed syllables, an /ɛ/ that follows a palatalized consonant can escape neutralization.[17] In his prescriptive work on Standard Belarusian pronunciation, Jankoŭski (1976) specifically warns against the failure to neutralize the mid front vowel /ɛ/ following a palatalized consonant in a word-final open syllable. According to him, speakers of Standard Belarusian should neutralize the contrast between e.g. /na'sʲɛnʲ:ɛ/ 'seed' n, Nom. Sg *versus* /na'sʲɛnʲ:a/ Gen. Sg. The recommended form for both noun forms is [na'sʲɛnʲ:a]. The very need for such a warning means that speakers ***do*** tend not to neutralize /ɛ/ in this position. The same tendency holds for other unstressed syllables, except for the immediately pretonic one, where a failure to neutralize //ɛ// to [a] is always judged as unacceptable, a sign of a regional or foreign accent. Unexpectedly, the unstressed vowel of the head foot supports less vocalic contrasts than its counterparts outside the foot. We conclude that the positional faithful-

[17] This is not to say that it is not lowered and centralized to a degree; however, it is still perceived as a mid front vowel.

ness account of neutralization at outlined in Alderete (1995) is not applicable to this variety of Standard Belarusian. Note, however, that its application to the strongly neutralizing variety of Standard Belarusian is quite straightforward: *MID neutralizes all non-high vowels in all unstressed syllables. In stressed syllables, all vowels are processed faithfully thanks to HEAD(σ)-IDENT(F). Note also that this solution in itself does not require any reference to foot structure.

3.2.4 Positional markedness as an alternative to positional faithfulness

In Alderete's (1995) analysis of Russian neutralization, /ɔ/ in the immediately pretonic syllable retains part of it featural specification thanks to positional faithfulness in the head foot. Belarusian calls for an inverted analysis: the immediately pretonic syllable must be analyzed as the least protected against neutralization. One way of formulating such an analysis is to postulate that the grammar specifically bans mid vowels from the head foot (assuming that the immediately pretonic and stressed syllables form an iambic foot). The ban can be expressed as the markedness constraint *MID parameterized for head feet:

(1) HEAD (FOOT) -*MID – Mid vowels are not allowed in head feet.

If undominated, this positional markedness constraint would neutralize all mid vowels in head feet but not outside them. However, stressed vowels do not undergo neutralization, which means that the constraint is outranked by the positional faithfulness constraint that prevents vowel neutralization in the head syllable (as opposed to the head foot): HEAD(σ)-IDENT(F) >> HEAD (FT) -*MID. Now our system will neutralize mid vowels in the weak part of the foot (the pretonic syllable) and preserve their quality in the strong part of the foot (the stressed syllable).

The account we have just sketched faces a theoretical problem. Smith (2002) argues that positional markedness constraints referring to strong positions (referred to as M/str constraints) are restricted by the Prominence Condition:

(2) The Prominence Condition (Smith 2002:43)

> Markedness constraints specific to strong positions are included in CON only if the general markedness constraints from which they are built call for the presence of perceptually prominent properties.

Under the Prominence Condition, a positional markedness constraint like HEAD (FOOT)-*MID cannot be part of the grammar. This is how Smith comments on the possibility of such constraints (*op. cit.*, p. 44):

> '[...] **M/str** constraints that are not augmentation constraints , such as the putative *MidV/σ́, would if anything make strong positions *less* prominent by stripping away potential phonological contrasts without adding to the perceptual salience of the position. With the Prominence Condition in place, such constraints are correctly predicted not to be included in CON.'

Of course, it can be argued that the neutralization of mid vowels to [a] in the weak part of a foot ***does*** augment its salience thanks to an increase in sonority and, correspondingly, in perceptual salience . One could , however, imagine a system in which vowel neutralization triggered by the putative *MidV/σ́ constraint (or by our HEAD (FT) -*MID constraint) leads to a decrease in sonority. If the mid front vowel /ɛ/ loses its [Phar] feature rather than its lingual features, then the result of neutralization will be /i/, a less sonorous vowel.[18] Whether neutralization triggered by a positional markedness constraint results in an increase or decrease in sonority of the respective vowel depends not on positional markedness itself but on the rest of the grammar. Perhaps this fact should be taken into account when deciding whether or not a given positional markedness constraint is admissible.

The problem posed by the Prominence Condition can be circumvented. For instance, one could reformulate the constraint militating against mid vowels in the head foot so that, rather than banning mid vowels, it requires that all the vowels in the head foot are maximally sonorous:

(3) MAXSON(HEAD) – vowels in the head foot must be maximally sonorous.

---

[18] In fact, this kind of neutralization is present in the Belarusian dialects spoken in the North East of Belarus and in the bordering regions of Russia. However, because this neutralization is not limited to the immediately pretonic syllable, it cannot be ascribed to positional markedness effects.

The maximization of sonority can be achieved e.g. through the neutralization to [a], which is the most sonorous vowel in the vocalic inventory of Belarusian. MAXSON(HEAD) is outranked by positional faithfulness constraints protecting vowels in stressed syllables. In addition, the constraint must be ranked lower than IDENT[HIGH] so that high vowels do not undergo neutralization within the foot. In fact, IDENT[HIGH] is undominated in Standard Belarusian, as the respective vowels are never neutralized in any position. On the other hand, MAXSON(HEAD) must outrank IDENT[MID] to enable the neutralization of mid vowels in the pretonic syllable. IDENT[MID] must also be outranked by a general markedness constraint against the mid back vowel *[Phar, Dor, Lab] in order for /ɔ/ to be neutralized in all unstressed syllables. The ranking is shaped as follows: HEAD(σ)-IDENT(F), IDENT[high] >> MAXSON(HEAD), *[Phar, Dor, Lab] >> IDENT[MID]. At this point, we choose to abstract away from the fact that /ɛ/ behaves differently with respect to neutralization depending on whether the preceding consonant is palatalized or not. We shall return to this issue later on.

The positional markedness account we have sketched above, while being able to explain the asymmetry observed between the immediately pretonic syllable and other unstressed syllables in Belarusian with respect to vowel neutralization, makes us no wiser as to why e.g. an [a] in the immediately pretonic syllable should be considerably longer than the same vowel [a] in other word-internal unstressed syllables. One way to approach this issue is to ascribe the difference in duration to a difference in metrical status: the immediately pretonic syllable is part of an iambic foot (the head foot), while the material outside of the head foot is not footed. Of course, one still would have to invoke some general principle by which non-footed material is inherently shorter than footed material. One such proposal is put forward by Crosswhite (2000, p. 117), who suggests that vowels in the footed syllables of Russian are moraic, and vowels in the unfooted syllables are non-moraic. Moraic vowels

> ‘are guaranteed to attain a certain minimum duration, since they possess timing units (moras). The nonmoraic (unfooted) syllables, however, are not guaranteed any minimum duration since they lack timing units – this might mean realisation of a nonmoraic vowel as very short, deleted, devoiced, or [...] highly overlapped with the preceding consonant.’

This approach, however, is not applicable to Standard Belarusian, where nuclei of all syllables remain full vowels irrespective of their position, so there is no obvious reason to believe that they lack timing units – unlike *schwas* in Russian.

If, alternatively, one assumes that at least some of the material outside of the head foot is footed, one will have to account for the fact that the weak member of the head foot is considerably longer than any of the potential strong members of non-head feet. Rather tellingly, those East Slavic dialects that show clear evidence of multiple feet in polysyllabic words such as rhythmical secondary stress patterns have neither neutralization nor significant reduction of vowels (see Crosswhite, 2000, pp. 116-117 for a short discussion and references).

3.3 Pretonic lengthening as feature spreading

3.3.1 High tone anticipation in Bantu and South Slavic

Before we consider how the special properties of the immediately pretonic syllable in Belarusian and Russian can be tackled in the tonal model of East Slavic accentuation presented earlier on, we would like to make a short excursion into the realm of phenomena whose tonal nature is undisputable. The first example of the kind of tonal process we are interested in is supplied by Kirundi and Kinyarwanda, two related East African tonal languages. The table below is taken from Hyman (2007) and is based on Philippson (1991). It presents different realizations of the input //umugozí// 'rope', where the acute (´) marks high tone.

Table 3-5: Anticipatory spreading and shifting of high tone in Bantu

	before L	**before H**	**before pause**
Rwanda	umugózí	umugózí	umugózi
'Hima'	umugózí	umugózi	umugózi
Standard Rundi	umugózi	umugózi	umugózi
Eastern Rundi	umúgózi	umúgózi	umúgózi

There are three possible output realizations of an input tone:

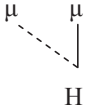
a. the underlying final high tone is realized on the sponsor and on the preceding syllable (bounded leftward spreading);
b. the underlying final high tone is realized only on the syllable preceding the sponsor (bounded leftward shifting);
c. the underlying final high tone is realized on the syllable preceding the sponsor and on the syllable before that (bounded leftward shifting followed by bounded leftward spreading).

In all of the output types, high tone is realized on the syllable directly preceding the tone sponsor. Hyman (2007) refers to this phenomenon as 'bounded high tone anticipation.' According to Hyman, high tone in the languages in question can be interpreted as accent (the marker of prominence). In this connection, he makes a reference to the following general statement from an earlier work of his: 'The more accent-like a H tone is, the more likely tonal anticipation will occur'(Hyman, 1978, p. 264). An even more general statement is made by Kiparsky (1973, p. 834), who points out that 'accent spread' in pitch-accent languages can be leftward as well as rightward and bounded as well as unbounded:

> In languages with free pitch accent, syllables before or after the main accent tend to have a redundant accent, which may be equal to the main accent or may be a secondary one. It may occur on all syllables to the left (or to the right, as the case may be) of the main accent, or just on the adjacent syllable […].

These observations are substantiated by pitch-accent South Slavic dialects. Hyman (2007) cites a case of high tone anticipation from one of the main varieties of Neo-Shtokavian Serbo-Croatian as analyzed by Inkelas and Zec (1988):

(4) Anticipatory high tone spreading in Serbo-Croatian

a. 

b.				
/papríka/	→	pápríka	'pepper'
/raazlíka/	→	raázlíka	'difference'
/ne-ráadnik/	→	né-ráadnik	'non-worker'

In the examples, doubled vowel letters mark phonologically contrastive long (bimoraic) vowels, with the first and the second letter corresponding to the first and the second mora respectively. Similarly to the Kirundi-Kinyarwanda case, a high tone is spread leftwards from its original position. No word can have more than one such structure, which means that tone has a culminative function. An additional proof of the accentual nature of tone in Serbian can be drawn from the fact that stress is assigned in alignment with high tone in such a manner that the stressed syllable contains the left member of the bimoraic high-tone domain.

While the tones of Kirundi-Kinyarwanda may seem a long shot from the intricacies of East Slavic stress, Serbo-Croatian, a South Slavic language, is much closer home. We have already seen that, due to leftward spreading, high tone is realized over two moras, which in practice often means two short syllables. Perception studies show that, although Serbian normally contrasts falling and rising tone in the initial syllable, the contrast is completely neutralized in monosyllabic words with short vowels (Gvozdanović, 1980). An even closer look at the prominence cues in Serbian reveals further interesting details. Ivić and Lehiste (1967), as reported by Gvozdanović (*op. cit.*), conclude that the most regularly manifested physical correlate of prominence in Serbo-Croatian is greater duration. In an earlier work, Ivić & Lehiste (1963) qualified this claim in the following manner: 'In words with short rising accents[19] on the first syllable followed by a short posttonic syllable, the greater length of the first syllable evidently suffices to indicate that the first syllable carries the accent. The durational cues remain ambiguous in the case of words containing a short rising accent and a posttonic length.' Correspondingly, Gvozdanović concludes that the durational cue is redundant. This is obviously true for those Serbo-Croatian dialects which have contrastive length (and tone), since in these dialects prominence can be unambiguously cued by fundamental frequency alone, and any lengthening of the stressed syllable can probably be seen as conditioned by the need to realize the required tonal contour. However, Gvozdanović reports that one of the speakers whom she studied, a resident of Belgrade, 'was perceived as having no vowel length oppositions outside the accented syllable (so that the accented syllable is phonetically the longest in a given prosodic word) [...]. This is not contradicted by dialectological investigations concerning the given area (cf. e.g. Ivic, 1958).' Obviously, for speakers like that, vowel duration is sufficient to determine *the location* of word

[19] 'Short rising accent' means that a high tone is linked to a monomoraic (short) vowel. Note also that in Standard Serbian post-tonic vowel length is contrastive.

prominence but not the tonal contour aligned with the location of prominence (i.e. falling versus rising). If we take into account that, as reported by Magner & Matejka (1971), tonal contrasts are not perceived (and, presumably, not produced – A.D.) by a large portion of young speakers of Serbian in e.g. the capital city of Belgrade, we can safely suppose that there might be a considerable number of speakers of Standard Serbian who no longer contrast either tone or vowel length (in fact, Gvozdanović reports that the same speaker that we mentioned earlier 'does not have the rising versus falling opposition in short syllable nuclei'). For these speakers, increased duration of the stressed syllable would no longer be a redundant phonetic artefact of the realization of tone contours but rather the main (perhaps the only reliable) prominence cue, just like in Standard Belarusian. Assuming that the analogy goes further, one could predict that the original bimoraic (and in many cases disyllabic) structure of the Serbian pitch-accent might be reflected in the speech of those Belgrade speakers for whom neither length nor tone is contrastive as, for example, post-tonic lengthening. In this respect, another speaker studied by Gvozdanović, Speaker 5, is of special interest. In his speech, 'the durations of all of the syllable nuclei were perceived as relevant' (*op.cit.*, p. 91). Needless to say, this speaker lacked contrastive vowel length. Irrespective of whether or not our hypothesis about the possibility of post-tonic lengthening in the Serbian dialects that have lost contrastive vowel length is correct, the analogy between bounded leftward tone-spreading in Neo-Štokavian dialects of Serbian and pretonic lengthening in Belarusian is definitely there.

At this point, let us note that Inkelas and Zec (1988) use tonal representations not only to describe the outputs but also to encode tone in the inputs and calculate the location of word prominence. To the best of our knowledge, the loss by some Serbian speakers of contrastive length and/or tone has not led to any regular ictus shifts. Therefore one can hypothesize with some confidence that the encoding of prominence in inputs (underlying representations) and the process of calculating the location of word prominence are still the same both for the Serbian speakers with contrastive tone and length and for those ones who no longer make these contrasts while retaining the original locus of prominence. In the case of the latter group of speakers, tonal representations and 'rules' would be used to determine the location of prominence, but the prominence itself is realized as pure duration with only a minor loss of contrastiveness. That duration can successfully 'mimic' pitch, follows unequivocally from the following observation made by Gvozdanović (1980) concerning the perception of prominence in the speech of one of the studied speakers who lacked contrastive vowel length: 'The duration of the

second syllable nucleus appears to play the same role as does the relative position of the fundamental frequency peak in the second syllable nucleus in the system of the other speakers.'

Can the analogy between Serbo-Croatian anticipatory tone spreading and Belarusian pretonic lengthening be captured formally? On the face of it, the answer should be in the negative: neither length (the cue to stress in Belarusian) nor stress can spread – indeed, the non-spreading nature of stress was one of the reasons behind the metrical revolution of Liberman (1975). Recall, however, that in our analysis of the accentuation of Belarusian non-derived nouns, we elaborate on Revithiadou's (1999) proposal that the accentual properties of East Slavic morphemes are encoded with a tone-like accentual feature. We suggest that the 'tone-like accentual feature' is nothing else but tone, and that the location of word prominence in Belarusian is determined by the docking site of a high tone. Given this approach, the puzzling phenomenon of Belarusian pre-tonic lengthening can be seen as a rather trivial case of anticipatory feature spreading, very much like the bounded high-tone anticipation in Serbo-Croatian and Kirundi-Kinyarwanda. Belarusian word prominence is obligatorily realized over two syllables just like Serbo-Croatian high tone is obligatorily realized over two moras. As we shall presently demonstrate, this analysis is less abstract than it might seem.

3.3.2 Pretonic lengthening in a pitch-accent dialect of Belarusian

The radical character of the conclusion reached in the previous section calls for some less ambiguous evidence. To put it bluntly, one would like to see the hypothetical phonological tone actually realized as pitch at least in some dialects of Belarusian. As we have already mentioned, Kryvicki (1959) and Vajtovič (1968) describe a few isolated dialects of Belarusian that employ pitch alongside duration to express word prominence. Similar reports have been published about several dialects spoken in the Ukraine in the vicinity of the border with Belarus.[20] Pretonic lengthening is present in all of these dialects. According to Vojtovič (1972, p. 29), word prominence in such dialects is expressed through 'strength and a pitch increase at the beginning of the syllable, de-

[20] For a review and analysis, see Bethin (2006). Bethin analyzes pretonic lengthening as an exceptional property of the dialects in question. The phonetic studies which we cited at the beginning of this chapter describe the same phenomenon in Standard Belarusian.

creasing towards the end; if a long vowel is present in the pretonic syllable, the increase in strength begins on the pretonic and decreases on the stressed syllable.'[21] The pretonic long vowels mentioned by Vojtovič are not contrastive, as vowel length is not contrastive in East Slavic in general. This is how Bethin (2006) describes the conditions for pretonic lengthening in this type of dialects: 'if the stressed vowel is a high or a high mid vowel, then the pretonic syllable is lengthened, if the vowel under stress is non-high, then the immediately pretonic syllable is of normal duration.'

The dialectal variety described by Kryvicki (1959) can have seven vowels under stress: a, o, ɔ, e, ɛ, u, i ~ ɨ (*op. cit.*, p. 98). While [o] and [ɔ] seem to be in complementary distribution, with the close variant occurring in closed syllables, [e] and [ɛ] are clearly contrastive, as the close [e] occurs not only as a positional variant of /ɛ/ in closed syllables but also as a context-independent reflex of the etymological low front vowel /æ:/. In the latter case, it can occur both in closed and in open syllables: dʑʲʊʲe 'two' fem., 'dʑʲevak '(adult) girls' Gen. Pl., sʲnʲeɣ 'snow', lʲes 'forest', 'nʲemʦaw 'German' n, Gen. Pl. (*op. cit.*, p. 99). In the immediately pretonic syllable, the vowel inventory is reduced to a, ɔ, ɛ, u, i ~ ɨ. As far as other syllables are concerned, the situation is obscured by a peculiar and rather irregular system of non-high vowel neutralization. Kryvicki (1959) hypothesizes that vowel neutralization in this dialect is of external origin, probably introduced into the system under the influence of neighbouring neutralizing dialects. However, it is quite clear that unstressed syllables (including the immediately pretonic one) cannot contain the close mid vowels [e] and [o].

One of the most striking characteristics of this dialect is the unusual articulation of non-high vowels in the immediately pretonic syllable before a stressed [i], [ɨ], or [u]. In this position, non-high vowels are considerably lengthened; in addition, they are described as exhibiting a 'peculiar intonation' (a falling or rising-falling pitch contour with a peak on the pretonic syllable and a trough on the stressed syllable) and an increase in intensity. This special articulation of pretonic vowels is so strong that some younger speakers, who do not employ pitch to mark prominence anymore, have shifted stress one position to the left[22]: [ɣá:r'buz] 'pumpkin' → ['ɣarbuz], [ɣaʊ́ɔ:'rɨw] '(he) spoke' → [ɣa'ʊɔrɨw], etc. (Kryvicki, 1959, p. 102).

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[21] The English version of the fragment is cited after Bethin (2006).

[22] In the examples, the acute mark (´) over a vowel indicates the peak of the pitch contour.

Vojtovič (1972) refines the description of the dialect. According to her, pretonic lengthening occurs before a stressed syllable containing one of the following four vowels: [i] ~ [ɨ], [u], [e], and [o]. If both the stressed and the immediately pretonic syllable contain high or close-mid vowels, no lengthening occurs.

Table 3-6: Examples of pretonic lengthening before mid high vowels

sʲ́ɛ:'stru	'sister' Acc. Sg	*but*	sʲɛ'stra	'sister' Nom. Sg
pč́ɔ:'ɬɨ	'bee' Gen. Sg	*but*	ʊɔ'dɔju	'water' Instr. Sg
kɔ́:'lʲena	'knee' n	*but*	rɔ'dnʲɛju	'kinfolk' Instr. Sg
zá:'vod	'factory'	*but*	tra'ʊɔju	'grass' Instr. Sg

Summarizing the existing reports on several East Slavic dialects that employ pitch to mark word prominence, Bethin (2006) states that in all of them prominence is signalled with 'a rising-falling pitch contour over two syllables.' In dialects similar to the Belarusian dialect we have just discussed, this LHL contour 'is distributed differently within the disyllabic domain, depending on the intrinsic duration of the vowel under stress.' Because the intrinsic duration of a stressed high vowel is not sufficient to accommodate the tonal contour, 'more of the contour is shifted onto the preceding syllable.' This account is illustrated in the following figure taken from Bethin (2006, p. 140):

Figure 3-1: The realization of the LHL contour over two syllables

1. LHL on stressed high vowels

a)

LH L

C a: 'C i

b)

(L) H L

C i 'C i

2. LHL on stressed non-high vowels

a)

L HL

C A 'C a

b)

L HL

C i 'C a

Let us see how Bethin's proposal tallies with our tonal analysis of Belarusian accentuation. According to her, the LHL pitch contour is superimposed, as it were, on the previously established prosodic structure of a given word in such a way that its left and right flanks coincide with the respective edges of the pretonic and stressed syllables. The peak of the contour is reached at the beginning of the stressed vowel or in the second half of the immediately pretonic vowel, depending on the intrinsic duration of the vowel under stress. Under our analysis of Belarusian accentuation, there is a more immediate relation between the locus of stress and the location of the pitch peak. Recall that we use tone to represent the underlying accentual properties of morphemes, and the locus of word prominence is determined by the docking site of a high tone. In the table below, we counterpoise the outputs of Bethin's pitch-imposition process with their inputs as supplied by our tonal analysis.

Figure 3-2: Juxtaposition of word prominence represented as tone and the surface distribution of pitch

1) LHL on stressed high vowel

a) after a low vowel

			H				LH		L
C	a	C	i	→	C	a:	'C	i	

b) after a high vowel

			H		(L)	H		L	
C	i	C	i	→	C	i	'C	i	

2) LHL on stressed non-high vowels

a) after a low vowel

			H				L		HL
C	a	C	a	→	C	a	'C	a	

b) after a high vowel

			H				L		HL
C	i	C	a	→	C	i	'C	a	

We can see that, unless the stressed vowel is high, the location of the contour peak coincides with the location of the feature H which, under our analysis of Belarusian accentuation, determines the locus of word prominence. If the feature H is hosted by a high vowel, the contour peak is shifted one position to the left. Unlike the anticipatory tone shift in Serbo-Croatian and East Bantu, the shift is conditional. However, despite the shift of H, its original host remains the prosodic head of the word, as this is the only position which supports the full array of vowel contrasts and vowels in this position never undergo neutralization. By contrast, even those immediately pretonic syllables that are lengthened, marked by an increase in intensity and host the contour peak still do not support mid high vowels and are occasionally neutralized. To account for this fact, we propose that the original location of H is directly recoverable from the post-lexical output, because we are dealing with tone spreading rather than shifting.[23] Now we are ready to present a modified version of the hypothetical input-output mappings.

Figure 3-3. H-spreading in the pitch-accent dialect of Belarusian

1. H originates on a high vowel

a) after a low vowel

b) after a high vowel

[23] Alternatively, the shifting of tone can be analysed as occurring within an iambic foot. In this interpretation, the original host of H corresponds to the foot head. Note, however, that the new host of H, which is the weak member of the hypothetical head foot, is phonetically more prominent than the head syllable. This is confirmed by the fact that those younger speakers who do not mark prominence with pitch reinterpret forms like [ɣá:r'buz] ‘pumpkin’ as ['ɣarbuz].

2. H originates on a non-high vowel

a) after a low vowel

```
                H                                   H
                |                                   |
C   A   C   a       →           C   a   'C  a
```

b) after a high vowel

```
                H                                   H
                |                                   |
C   I   C   a       →           C   i   'C  a
```

In this system, the ban on the realization of high pitch on head syllables whose nuclei are occupied by high vowels is resolved through the leftward spreading of H and the creation of a left-headed tonal domain. The head of the tonal domain carries the tonal peak, while the tail of the domain, the source of H, remains the head of the phonological word. The lengthening of non-high vowels onto which H has been spread is seen as an opportunistic improvement of the phonetic conditions for the realization of a pitch contour (the intrinsic length of non-high vowels facilitates an additional lengthening of these vowels to accommodate the pitch contour). Data from other East Slavic dialects discussed below seems to be compatible with an analysis based on the spreading rather than shifting of the feature H.

3.3.3 Neutralizing East Slavic dialects without neutralization in the immediately pretonic syllable

Bethin (2006) analyzes a group of Russian dialects from the Vladimir-Volga Basin area. In these dialects, the stressed and the pretonic syllable are equally long, and the vowels in these two syllables are neither neutralized nor reduced. Other syllables are strongly reduced. Below we cite a number of examples taken from Table 1 in Bethin (2006, p. 130).

Table 3-7: Neutralization in a group of Vladimir-Volga Basin dialects

/golo'va/	[gəlo:'va:]	'head'
/kula'kʲi/	[kəla:'kʲi:]	'fists'[24]
/dalʲe'ko/	[dəlʲe:'ko:]	'far away'
/ogur'tsi/	[ugu:r'tsi:]	'cucumbers'
/tʲemno'ta/	[tʲimno:'ta:]	'darkness'
/posa'ʒu/	[psa:'ʒu:]	'I will plant'
/'vʲidʲela/	['vʲi:dla]	'(she) saw'
/'mʲesʲatsa/	['mʲe:sʲtsa]	'month' (Gen. Sg)

Note the lack of neutralization in the pretonic syllable and strong neutralization *cum* reduction in other unstressed syllables. A metrical analysis of these dialects based on iambic footing faces a serious problem: in phonetic terms, both syllables of the hypothetical iambic foot are equally prominent. Moreover, vowel neutralization does not apply not only to the stressed syllable, but also to the pretonic one – unlike what we saw in the Belarusian pitch-accent dialect discussed above. Apparently, word prominence in the Vladimir-Volga Basin dialects is evenly spread out over two syllables.

In some of the dialects, 'the high tone is associated with the pretonic syllable, and the vowel in that syllable lengthens to accommodate the pitch rise' (Bethin, 2006, p. 139). When discussing the Belarusian pitch-accent dialect, we saw that the tonal peak was shifted to the left from the stressed vowel if it was a high vowel. It seems that the pitch-accent varieties of Vladimir–Volga Basin dialect exemplify a more general version of this process, in which the tonal peak is always realized on the immediately pretonic vowel, irrespective of the quality of the stressed vowel. We propose that, in these dialects, all output representations with at least one pretonic syllable contain a left-headed disyllabic tonal domain formed as a result of H-spreading. Within the tonal domain, the left syllable is the head and hosts the tonal peak. Both syllables are made prominent through lengthening. The feature H is thus realized as high pitch and lengthening in the head of the tonal domain and as lengthening alone in the tail of the tonal

[24] We have replaced the gloss provided by Bethin ('Kulaks' – a historicism referring to prosperous peasants in the Russian Empire and the USSR) with the common meaning of the word: 'fist' n, Nom. Pl.

domain. Note that, in this system, either pitch or duration can be analyzed as redundant (recall our discussion of the role of duration as the cue to prominence in Serbo-Croatian). The durational cue, being the more general of the two, since it is realized on both syllables linked to the feature H, may be reanalyzed as *the only* cue, rendering pitch redundant. In this new system, the two syllables associated with the feature H are lengthened but an actual pitch movement is not realized on either of them. The resulting system would describe those varieties of Vladimir–Volga Basin dialects that do not employ pitch to mark word prominence.

These 'durational' dialects have an important property that resembles Standard Belarusian: both the stressed and the pretonic vowels are lengthened irrespective of the quality of the stressed vowel. The system of Standard Belarusian is different in that, despite the lengthening of the pretonic syllable, its nucleus undergoes neutralization. Moreover, for many speakers, neutralization in the immediately pretonic syllable has a wider scope than neutralization in other unstressed syllables. Recall that Belarusian neutralizes the mid vowels /ɛ/ and /ɔ/ to [a] in unstressed syllables. In native words, the neutralization of /ɛ/ after phonetically palatalized ('soft') consonants is optional in all the unstressed syllables except for the immediately pretonic one. Thus, paradoxically, while being one of the two longest syllables in any polysyllabic word, the immediately pretonic syllable supports the least number of vocalic contrasts. In the next section, we look at the peculiarities of vowel neutralization in the immediately pretonic syllable from the perspective of a tonal analysis.

3.3.4 Outline of a tonal analysis of dissimilative vowel neutralization

We have seen that the location of the pitch peak in the Belarusian pitch-accent dialect described by Kryvicki (1959) and Vajtovič (1968) is sensitive to the quality of the stressed vowel and in particular to its height. In a number of Russian dialects, the height of the stressed vowel determines the type of vowel neutralization in the immediately pretonic syllable. Traditionally this kind of neutralization is referred to as ***dissimilative***. Consider the following table, which compares the distributions of vowels in the pretonic and stressed syllables in three groups of Russian dialects labelled by the respective geographical locations:

Table 3-8: Neutralization in the immediately pretonic syllable in three groups of Russian dialects with dissimilative neutralization, after Fig. 12 in Bethin (2006)

	immediately pretonic	*stressed vowel*	*sʲelo* 'hamlet' in various case forms
a. Don pattern	[a]	/ɪ~ɨ, u/	[sʲa'lu][25]
	[ə] or [i]	/e, o, ɛ, ɔ, a/	[sʲi'lo, sʲi'lʲe, sʲi'lɔm, sʲi'la]
b. Obojan pattern	[a]	/i~ɨ, u, e, o/	[sʲa'lo, sʲa'lʲe]
	[ə] or [i]	/ɛ, ɔ, a/	[sʲi'lɔm, sʲi'la]
c. Zhizdra pattern	[a]	/i~ɨ, u, e, o, ɛ, ɔ/	[sʲa'lo, sʲa'lʲe, sʲa'lɔm]
	[ə] or [i]	/a/	[sʲi'la]

In all the three types of dialects, a mid front vowel in the immediately pretonic syllable can surface as [a]. We have already seen the same kind of neutralization in Standard Belarusian, where it is unconditional. In the Russian dialects presented above, neutralization to [a] is conditioned by the quality of the stressed vowel. In the Don pattern, it takes place if the stressed syllable contains a high vowel. In the Obojan pattern, the range of stressed vowels triggering neutralization to [a] is expanded to include close-mid vowels alongside high vowels. Finally, in the Zhizdra pattern, the neutralization occurs before all vowels but /a/.

These neutralization patterns lend themselves to a rather elegant classification in terms of an element-based theory of representation. Element-based theories of representation posit that segments are composed of univalent features that are directly phonetically interpretable (variably referred to as elements, particles, and so on). The relation between elements can be either symmetric or asymmetric (involving headedness). In the latter case, the relation between elements is said to be that of dependency. As Ewen (1995, p. 574) explains, 'dependency in segment-internal representations is the formal characterization of relative prominence.' For example, the vowel /e/, composed of the head element [I] and the dependent element [A], 'is characterized as being a vowel in which frontness is more prominent and sonority less prominent than for /ɛ/'

[25] In the original table, the cell is empty. The word form we have adduced is the Dat. Sg form of *selo*.

(*ibidem*). In an element-based theory of representation, the vocalic inventories of the above dialects can be represented in the following way:

(5) Element-based representations of the vocalic inventories in Table 2-8.

/i/	[I]	/e/	[A I]	/ɛ/	[A I][26]	/a/	[A]
/u/	[U]	/o/	[A U]	/ɔ/	[A U]		

The notation used here is a fusion of those employed in Ewen (1995) and Harris and Lindsey (1995). Following Harris and Lindsey, we represent elements with capital letters and enclose them in square brackets; the relation of dependency between elements is marked by underlying the head element. Following Ewen, we represent the elements that compose low mid vowels as headed by [A]; the representations of high mid vowels are headed by [I] or [U].

The neutralization facts of the three dialectal groups in (11) can be summed up as follows. In the Don pattern, pretonic neutralization to [a] occurs before a vowel that does not contain an [A] element. In the Obojan pattern, it takes place if the stressed vowel does not have an [A] or if [A] is the dependent element. In the Zhizdra pattern, pretonic neutralization to [a] occurs if [A] is not the only element of the stressed vowel.

Bethin (2006) cites sporadic reports concerning the existence of pitch-accent systems in this type of dialects. In her analysis, in the respective pitch-accent systems, the 'pitch peak is associated with the stressed syllable if it has a vowel of sufficient intrinsic duration. If the stressed vowel is too short, then the pitch peak falls on the intrinsically longer pretonic low vowel. If the stressed vowel is long enough, then the pitch contour is fully realizable on the stressed syllable.' We would like to move one step further and suggest that the pretonic neutralization to [a] in these dialects could have originated as a way to optimize the realization of tone. Unlike the Belarusian pitch-accent dialect described above, in which the leftward shifting of high tone onto the pretonic mid vowel was accompanied by the lengthening of the same, the dissimilative Russian dialects apparently endow immediately pretonic mid vowels with additional duration by obligatorily lowering them to [a].

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[26] The mid low vowel is more often represented as the non-headed complex [A I], the headed representation [A I] being reserved for the low front vowel /æ/. Modern East Slavic dialects lack /æ/, so the distinction is irrelevant in our case.

In a pitch-accent system with the Zhizdra pattern of neutralization, high tone on the prosodic head is licensed only if the respective vowel is an [a]=[A]. When the composition of the stressed vowel includes any other elements, the high tone is shifted leftwards. If the new host is a mid vowel, its dependent elements are not realized and the pretonic vowel surfaces as [A]=[a]. A pitch-accent system with the Obojan pattern of neutralization would be different in that high tone is licensed by an [A] element which is not dependent: /ɛ/=[A I]; /ɔ/=[A U], a=[A]. If the composing elements of the stressed vowel do not include an [A] or include a dependent [A], the high tone is shifted onto the preceding vowel, which, if mid, is lowered to accommodate the pitch contour. In the Don pattern, high tone is licensed by an [A] element irrespective of its dependency status (whether it is the head or the dependent element). Correspondingly, high tone is shifted leftwards and the pretonic mid vowel is lowered only if the composition of the stressed vowel contains no [A]: that is to say, if it is [i] or [u].

The same tonal analysis can apply to those dialects with dissimilative neutralization which do not employ pitch to mark word prominence. In these dialects, the process is fully phonologized: the functional reasons behind the lowering of mid vowels before those stressed vowels which, in a given dialect, could not support a high tone are gone. How and why would such dialects keep a process whose phonetic grounding has been lost? As to how, we have already suggested for Belarusian that the tonal representations of inputs have not been changed since the disappearance of surface pitch accent and that the location of word prominence is still determined on the basis of tonal representations. In other words, the only difference between the innovative stress dialects and the archaic[27] pitch-accent dialects is that the feature H is not realized as pitch in the innovative dialects. Otherwise, the two groups remain identical with respect to their word prominence systems. As to the question why the system of dissimilative pretonic neutralization has been retained despite the disappearance of pitch, we would like to point out that the reasoning applied to pitch is still very much applicable to the new cue to word prominence – duration. The intrinsic duration of high vowels does not allow for a considerable lengthening under stress. One might say that mid vowels in the immediately pretonic syllable become lowered and thereby acquire longer duration ***instead*** of their high counterparts in the stressed syllable.

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[27] Assuming that pitch in these dialects is a remnant of the Old East Slavic accentual system rather than an innovation.

3.3.5 Towards a comprehensive analysis of pretonic lengthening and neutralization in Belarusian

Standard Belarusian differs from the three types of dissimilative Russian dialects we have just discussed in that vowel neutralization in the immediately pretonic syllable is not dependent on the quality of the stressed vowel.[28] In terms of a tonal analysis, this variety of Belarusian must have generalized tone spreading in such a way that it applied across board, irrespective of the quality of the stressed vowel – similar to the pitch-accent varieties of the Vladimir-Volga Basin dialects of Russian. However, just like in the dissimilative dialects of Russian, the intrinsic duration of the immediately pretonic mid vowel was improved by lowering it to [a]. An increase in duration facilitated the production of the pitch contour marking word prominence. In modern Belarusian, even though tone is no longer realized as pitch, the lowering of mid vowels in the pretonic syllable increases the overall salience of the disyllabic domain which marks word prominence.

Let us illustrate the parallel roles of duration in Standard Belarusian and pitch in East Slavic pitch-accent systems with an example. In the output form of our example, vowels with no diacritic are of normal duration, one dot (V.) marks an increase in duration, while maximum duration is marked with two dots (V:). In this particular case, the durational differences of the first three syllables are both relative and absolute, because each syllable is open and contains the same vowel in the nucleus.

(6) The distribution of duration in a 5-syllable Belarusian word form

[ɣala.'dra:načkaj] ‘tramp’ n, fem., Dim., Instr. Sg

In the example, duration starts off on a neutral level in the first syllable, rises in the second syllable, reaches its peak in the third (stressed) syllable, and returns to the neutral level in posttonic syllables. In the next figure, we represent the same word by putting its syllables on different levels corresponding to different degrees of duration from the neutral (lowest) duration to the maximum duration in the head syllable.

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[28] Dissimilative neutralization is present in north-eastern Belarusian dialects.

(7) A graphic representation of the distribution of duration

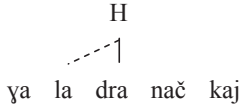
dra:

ła.

ɣa nač kaj

A rather obvious analogy to this distribution of duration is the movement of a pitch contour. Increases and decreases of duration correspond to (one is tempted to say 'imitate') the rising and falling of pitch. As we have made clear on several occasions, we propose that the representation of prominence is tonal both in pitch-accent and in purely durational dialects of Belarusian. The feature H is spread from its previously determined host onto the preceding syllable, as illustrated below:

(8) Anticipatory H-spreading



Under this analysis, the lengthening of the pretonic vowel in Belarusian is nothing other than the phonetic expression of anticipatory tone spreading.

The domain of the application of H-spreading is the phonological word. Consider the following phrases: [ja nʲɛ xa'ču] 'I do not want' and [ja'na nʲa 'xoča] 'she does not want.' For speakers who do not neutralize /ɛ/ in /Cʲɛ/ sequences outside of the immediately pretonic syllable, the negative particle /nʲɛ/ surfaces as [nʲa] if the first syllable of the following lexical word is stressed; otherwise it surfaces as [nʲɛ]. The same applies e.g. to the preposition /bʲɛz/ 'without', which surfaces either with [ɛ] or [a], depending on whether or not the following syllable is stressed: [bʲɛzʲ ja'ɣo] 'without him' *but* [bʲaz 'nas] 'without us.' In subsequent discussion, we assume that H-spreading and related vowel neutralization both happen post-lexically. Correspondingly, we treat the original association with H as part of the input to the post-lexical stratum.

For speakers who neutralize /ɛ/ and /ɔ/ in all unstressed syllables, an OT analysis of neutralization is rather trivial and requires the standard markedness constraints of the type 'do not be X.' If ranked above the respective general faithfulness constraints but

below the corresponding positional faithfulness constraints categorized for the head syllable, a markedness constraint like *MID will produce the required highly neutralizing system, in which the mid vowels /ɔ/ and /ɛ/ are neutralized in all unstressed syllables. If element-based representations are used, we can see this kind of neutralization as a result of a ban on complex vowels in unstressed syllables.

We propose that speakers with a more restricted neutralization pattern (those who do not neutralize the mid vowel /ɛ/ after palatalized consonants, unless immediately pretonic) have essentially the same system: mid vowels are banned. The system, however, allows for two regular exceptions. Just like in the highly neutralizing variety, vowels escape neutralization under stress (due to positional faithfulness). Another exception is constituted by /C^{j}ɛ/ sequences, which are only neutralized in the immediately pretonic syllable. How can this exception be expressed? The most obvious hypothesis, namely, that the faithfulness constraint IDENT[MID] outranks the markedness constraint against mid front vowels *e, fails, because /ɛ/ undergoes obligatory neutralization after non-palatalized consonants in native vocabulary: ['rɛk^{j}i] 'rivers' but [račn^{j}i'k^{j}i] 'river transport workers.'

Many Slavic languages feature palatalized and velarized consonants. These secondary articulations often correspond to the frontness/backness of the following vowel. Zubritskaya (1995), as reported in Rubach (2000a), proposes the following OT constraint to capture this generalization:

(9) CV LINK: In CV all features linked to a vowel must also be linked to a consonant.

Rubach (*op. cit.*) points out that there is an asymmetry 'in the ability of front vowels to palatalize consonants.' In particular, palatalization before high vowel is more likely than palatalization before mid vowels. Correspondently, 'the backness agreement between consonants and high vowels is different from the backness agreement between consonants and mid vowels.' He proposes a less general constraint, PALATALIZATION-i, which requires that 'a consonant and a following high vowel agree in backness.' Presumably, the same kind of constraint can be formulated for mid vowels, too:

(10) PALATALIZATION-e: a consonant and the following mid vowel agree in backness.

This constraint favours Belarusian surface forms of the [C^{j}ɛ] type, where a palatalized consonant is followed by a front mid vowel. However, due to its specificity to mid vowels, it cannot prevent neutralization through lowering for the obvious reason that a CV sequence like [C^{j}a] does not violate PALATALIZATION-e: [a] is not a mid vowel. It seems that a more general constraint, a constraint which ***is*** violated by [C^{j}a] sequences must be active in Belarusian, after all. It is not essential for our discussion whether this is a very general constraint akin to CV LINK, which requires that all features linked to V should also be linked to C, or a more specific constraint militating against CV sequences where the consonant and the vowel disagree with respect to the value of the feature [back]. For the sake of simplicity, we shall refer to the constraint as CV LINK. This constraint is outranked by MAXSON(HEAD), which favours the most sonorous vowels in the head foot and thus enforces the lowering of mid vowels in the immediately pretonic syllable. The ranking MAXSON(HEAD) >> CV LINK means that /C^{j}ɛ/ sequences will be processed faithfully in all unstressed syllables but the immediately pretonic one. The fact that palatalized consonants are not depalatalized before a pretonic [a] resulting from ɛ-lowering means that the feature formerly shared with /ɛ/ is preserved on the consonant. A tonal analysis would differ from the one we have just outlined in that the disyllabic domain formed by the stressed and the immediately pretonic syllable is not a metrical foot but a tonal domain created as a result of anticipatory H-spreading.

One of the differences between our model of East Slavic accentuation and that proposed in Revithiadou (1999) is that we see the 'tone-like' accentual feature – which, in our interpretation, is just tone – as directly interpretable by phonetics, without the mediation of metrical structure. In this section, we have proposed that the peculiar realization of the immediately pretonic syllable in a variety of East Slavic neutralizing systems which use pitch as a marker of word prominence can be explained as resulting from tone spreading or shifting. In Bethin's (2006) analysis, a pitch contour is superimposed on the existing metrical structure. In our analysis of Belarusian accentuation, tone is employed to mark prominence both in the input and in the output forms, so that the head syllable always has an associated high tone. Under such an analysis, pitch contours are not superimposed on stress but are derived through the spreading/shifting of high tone supplied by the lexical stratum of phonology. In this way, East Slavic pitch-accent dialects are analogous to Neoštokavian Serbo-Croatian, where there is an obligatory leftward spreading of high tone.

The above approach is fairly uncontroversial, if applied to pitch-accent systems. We propose, however, that the stress counterparts of East Slavic pitch-accent systems can be accounted for in the same manner. The only difference is that, in the respective stress systems, the tonal feature is realized not as pitch but as duration. Systems with 'dissimilative' neutralization in the immediately pretonic syllable are especially revealing in this respect. In the pitch-accent varieties of such systems, the leftward tone shift and the lowering of the pretonic vowel are conditioned by the quality of the vowel in the head syllable and are clearly attributable to the realization of the culminative pitch-contour. The intrinsic duration of a high vowel is not sufficient for the proper realization of a pitch contour; therefore, the pitch contour spreads across two syllables. The proper realization of pitch contour is facilitated by the lowering of mid vowels in the pretonic syllable, since, as a result of lowering, the pretonic vowel acquires a longer intrinsic duration. The loss of surface pitch is of no consequence for the pretonic lowering (neutralization) pattern: mid vowels are still lowered before high vowels but not before vowels with longer intrinsic duration. We take it as an indication of the stability of tonal representations in systems that have lost surface pitch.

4. A tonal reanalysis of the accentuation of athematic nouns in Indo-European

4.1 Background information on Indo-European prominence and athematic nouns

In this chapter, we shall develop a strictly tonal analysis of the accentuation of athematic nouns in Late Proto-Indo-European (hereinafter referred to as Indo-European or IE).[1] Our analysis will be contrasted to two generative accounts of IE accentuation: one performed in Halle/Idsardi's metrical framework by Kim (2002) and the other performed in the Optimality Theory framework by Frazier (2006). It should be emphasized that our objective is limited to testing a strictly tonal model against the two metrical accounts. Correspondingly, we take the data and basic generalizations contained therein for granted. For a recent critical reassessment of the traditional classification of Indo-European accentuation patterns, see Kiparsky (2010a). Kim develops and refines his metrical grid analysis in Kim (to appear).

It has often been suggested with varying degree of confidence that, at a late stage of Indo-European, word prominence was realized by a high or rising pitch on the prominent syllable. Ringe (2008, p. 21) asserts categorically: 'It seems clear that the surface instantiation of accent was high pitch (as attested in Vedic Sanskrit and Ancient Greek, both described by native grammarians).' Clackson (2007, p. 77) acknowledges that, in view of the Greek and Sanskrit facts, 'the most economical reconstruction would also be a pitch accent' but cautions against excessively positive statements: 'it seems preferable to reserve judgement until we have better knowledge of likely pathways of accent change.' Generally, however, researchers seem to agree that there is ample evidence in favour of the pitch hypothesis (Fortson, 2004; Gamkrelidze & Ivanov, 1995; Lehmann, 1952). Correspondingly, whenever we refer to stress, what is actually meant is a pitch movement marking the most prominent syllable in a given word.

The term '***athematic'*** is applied to nouns and verbs whose stems end in a consonant or the high vowels /i/ and /u/, which function on par with sonorant consonants. Most

[1] The results published in this chapter were first presented at a talk held on March 29th, 2007 at Radboud Universiteit in Nijmegen, Netherlands.

commonly, an athematic noun would consist of the root, a suffix and a case ending (R + S + E).[2] Some nouns are formed without a suffix (R + E); they are called ***root nouns***. The stems of ***thematic nouns*** end in a thematic vowel (-e- / -o-). For a study of accentuation, the distinction between thematic and athematic nouns is relevant insofar as 'thematic nouns and verbs are precisely those which show fixed accent as contrasted with varying accent of the athematic types' (Gray, 1932, p. 198). Apart from accentual alternations, athematic nouns show ablaut alternations. In most instances, an unstressed morpheme surfaces in the zero-grade (without a 'proper' nucleus that can only be formed by /e/, /o/ or their long counterparts). For example, the suffix *-ti-* surfaces as *-tey-* when stressed and *-ti-* when unstressed. The only regular exception to this generalization is constituted by the suffixes of amphikinetic nouns (see the definition of 'amphikinetic' below), which, although unstressed in the strong cases, surface in the /o/ grade. The term ***strong cases*** refers to the nominative and accusative. All the other cases are referred to as ***weak***.

Below we reproduce a table which shows the accentuation and ablaut grades of the four accentual classes of athematic nouns (acrostatic, proterokinetic, hysterokinetic, and amphikinetic). Stress is marked by an *acute* mark (´) over the respective vowel.

Table 4-1: Accent classes of athematic nouns according to Fortson (2004) as presented in Frazier (2006, p. 27)

		R	S	E		
acrostatic	strong	ó/é:	ø	ø	nom sg: *nók^{w}-t-s	'evening'
	weak	é	ø	ø	gen sg: *nék^{w}-t-s	
proterokinetic	strong	é	ø	ø	nom sg: *mén-ti-s	'thought'
	weak	ø	é	ø	gen sg: *mn̥-téy-s	
hysterokinetic	strong	ø	é	ø	nom sg: *ph$_2$-té:r	'father'
	weak	ø	ø	é	gen sg: * ph$_2$-tr-és	
amphikinetic	strong	é	ø	ø	nom sg: *d^{h}ég^{h}-o:m	'earth'
	weak	ø	ø	é	gen sg: *d^{h}g^{h}-m-és	

[2] R, S, and E stand for 'root', 'suffix', and 'ending' respectively.

In ***acrostatic*** nouns, stress is on the root both in the strong cases and in the weak cases. In ***proterokinetic*** nouns, it alternates between the root (strong cases) and the suffix (weak cases). In ***hysterokinetic*** nouns, the alternation is between the suffix (strong cases) and the ending (weak cases). ***Amphikinetic*** nouns show an alternation between root stress (strong cases) and inflectional stress (weak cases). In addition, those amphikinetic nouns which take the zero ending in the locative case show stress on the suffix in the locative. Such nouns are referred to as ***holokinetic***.

4.2 Brackets-and-edges account

Kim (2002) offers an analysis of the accentual patterns of Indo-European athematic nouns that is based on Halle/Idsardi's metrical model. A morpheme may be specified as underlyingly accented (projecting a left bracket onto line 0, in terms of Halle/Idsardi's model). The calculation of IE stress is performed in the following manner:

1) Project syllable heads
2) Project L boundary of heads lexically specified for accent
3) Edge Marking: RRR
4) Head Marking: L
5) Edge Marking: LLL
6) Head Marking: L

Under this analysis, stress will be assigned to the leftmost syllable whose head is lexically specified as accented. If a form has no such syllable heads, stress will be assigned to the leftmost syllable. This is, of course, the same Basic Accentuation Principle that we discussed earlier in our review of literature on Russian stress.

4.2.1 Root nouns with alternating stress

Recall that root nouns are nouns whose stems do not contain a suffix. In root nouns with stress alternations, stress is assigned to the root in the strong cases and to the ending in the weak cases. In Kim's analysis, the roots of such nouns are underlyingly unaccented (they do not project a left bracket onto line 0). As for the endings, the strong endings are underlyingly unaccented while the weak endings are accented. Below we reproduce his

derivation of stress in the accusative and genitive cases of the IE word meaning ‘face’: **h₂entm̥* and **h₂entes* correspondingly[3].

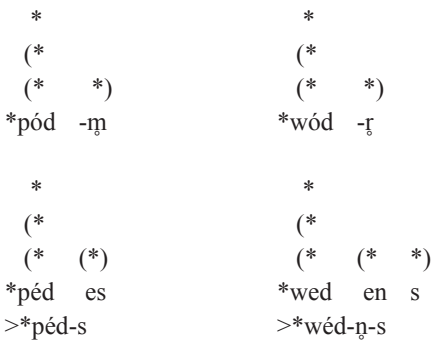
Figure 4-1: The derivation of stress in root nouns after Kim (2002, p. 24)

In the strong cases, no potential nucleus projects a left boundary, while in the weak cases the case ending projects such a boundary. As a result, in the strong cases, stress is assigned by default at the left edge, and in the weak cases, it is on the ending.

4.2.2 Athematic nouns with non-alternating stress (acrostatic nouns)

In nouns of this class, stress remains on the root throughout the declension paradigm. Kim’s analysis here is parallel to what Halle (1997) proposes for Russian nouns with a fixed root stress: roots are underlyingly specified as projecting a left bracket onto line 0. Left edge and head parameters ensure that stress falls on the first head that projects a left boundary. Below we reproduce the grids for the Acc. (a strong case) and Gen. (a weak case) of the IE cognates of the words ‘foot’ and ‘water.’

Figure 4-2: The metrical grids of two athematic nouns after Kim (2002, p. 31)



[3] The symbol h_2 denotes one of the laryngeals reconstructed for IE.

4.2.3 Amphikinetic nouns

In amphikinetic nouns, stress falls on the root in the strong cases, and on the ending in the weak cases. This pattern can be captured if it is assumed that the stem (root + suffix) is not underlyingly accented (that is, neither morpheme contains a nucleus that projects a left boundary on line 0). Since strong endings are unaccented, stress is assigned to the leftmost syllable. Weak endings are accented, and therefore stress is assigned to the ending. The grid below is for the Nom. and Gen. forms of **d^{h}eǵ^{h}ōm* ('earth') and **pentoh$_2$s* ('path').

Figure 4-3: The metrical grids of two amphikinetic nouns after Kim (2002, p. 35)

```
   *                                          *
  (*                                         (*
   *     *     *)                             *     *     (*)
*dʰeǵʰ   om    s    >   *dʰéǵʰ-ōm      *dʰeǵʰ   om    es   >   *dʰǵʰ-m-és

   *                                          *
  (*                                         (*
   *     *     *)                             *     *     (*)
*pent    oh₂   s    >   pént-oh₂-s       *pent    oh₂   es   >   *pn̥t-h₂-és
```

The word **d^{h}eǵ^{h}ōm* 'earth' belongs to the holokinetic subgroup of amphikinetic nouns. Holokinetic nouns follow the amphikinetic pattern in all the case forms, except for the locative. Unlike other weak cases, the locative form *d^{h}ǵ^{h}ém* is stressed on the suffix. This is unexpected: hitherto its suffix has been analyzed as underlyingly unaccented and, correspondingly, we expect the default word-initial stress. Kim (*op. cit.*) accounts for this fact by positing an underlyingly accented zero-ending. Stress is assigned to the ending and then retracted onto the preceding syllable.

Figure 4-4: The metrical grid of the locative form of a holokinetic noun (Kim, 2002, p. 35)

```
            *
           (*
   *     *  (*)
*dʰeǵʰ   om   ø   >   *dʰǵʰém
```

4.2.4 Proterokinetic nouns

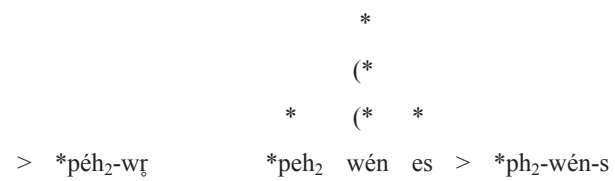
In this group of athematic nouns, the alternation of stress is between the root in the strong cases and the suffix in the weak cases.

Table 4-2: Accentuation of proterokinetic nouns after Kim (2002, p. 37)

nom.sg	*$h_2$éw-i-s	'bird'	*d^héh_1-t-i-s	'setting'	*g^wém-t-u-s	'coming'
acc.	*$h_2$éw-i-m		*d^héh_1-t-i-m		*g^wém-t-u-m	
gen.	*h_2w-éy-s		*$d^h h_1$-t-éy-s		*g^wm̥-t-éw-s	

If one assumes that both the root and the suffix are underlyingly accented, then the acrostatic pattern (fixed stress at the left edge) is expected. The same pattern is to be expected if the root is underlyingly accented but not the suffix. If the suffix is accented but the root is unaccented, then we expect an unattested pattern with fixed stress on the suffix. The solution proposed by Kim (*op. cit.*) is as follows: the root of a proterokinetic noun is underlyingly unaccented. The weak cases take an accented allomorph of the suffix, and the strong cases take an unaccented one. As a result, in the strong cases, stress is assigned by default at the left word edge. In the weak cases, stress is assigned to the underlyingly accented allomorph of the suffix, as shown below.

Figure 4-5: The metrical grid of a proterokinetic noun after Kim (2002, p. 39)



Kim recognizes that this solution involves a significant representational redundancy, as the distribution of suffix allomorphs in e.g. **$h_2$éw-i-s* / **h_2w-éy-s* is clearly stress-dependent, similar to other ablauting morphemes (the suffix is realized as -i- when not stressed and as -éy- under stress). For the suffix *-wr-* / *-wén* the allomorphic account seems to be plausible enough, as the two allomorphs differ not only with respect to the absence / presence of the vowel but also with respect to the final sonorant. Kim (2002) proposes that the allomorphic principle was extended to other suffixes in the proterokinetic group and, further, that the suffix and ending were 'combined into an unanalyzable

desinence.' That is to say, the structure of proterokinetic nouns changed from R+S+E to R+E, where endings became stem-specific and changed their form: *-im* rather than *–i-m* in the accusative, *-eys* rather than *–ey-s* in the genitive, etc.

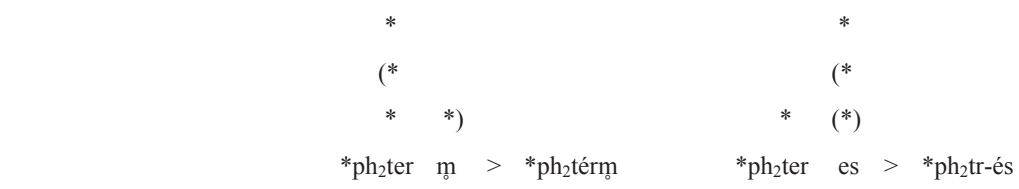
Frazier (2006) criticizes this solution and points out that case endings were easily recoverable from elsewhere in the language, so it is unlikely that speakers would be unable to isolate them in proterokinetic nouns only. She also cites comparative-historic evidence from Hittite, in which

> 'the endings undergo changes /…/ that could not be explained if the speakers did not recognize them as distinct morphemes. For example, the suffix *ew followed by the genitive singular inflectional ending *s should have become, according to regular sound laws, *aw-s* in Anatolian. However, this sequence of morphemes becomes *awas*. The second *a* is inserted by analogy with other inflectional endings that have this vowel (Weitenberg, 1984). If this sequence was not recognized as two different morphemes by speakers, there would no way to explain the epenthetic *a*.'

4.2.5 Hysterokinetic nouns

Hysterokinetic nouns, in which stress alternates between the suffix in the strong cases and the ending in the weak cases, present a problem which is similar to that posed by proterokinetic nouns. Namely, the accentuation of the strong cases seems to indicate that the suffix is underlyingly accented. If so, one can expect a pattern with immobile stress on the suffix. This is not the case. Recognizing this problem, Kim (2002) proposes that the root and the suffix have fused into one root morpheme. This is illustrated below with the accusative and genitive cases of 'father.'

Figure 4-6: The metrical grid of a hysterokinetic noun after Kim (2002, p. 45)



Frazier (2006), while acknowledging that this kind of reanalysis could have taken place in the case of family relation terms, points out that

> 'other hysterokinetic nouns exist in which such morpheme reanalysis is not tenable. For example, the hysterokinetic stem *dh_3-ter- 'giver' is composed of the verb root for 'give' (*deh_3) and a suffix that creates animate agent nouns (*ter) (Tichy, 1995). The root is clearly a morpheme as it exists in verbal and nominal forms and the suffix is used with the same meaning in many other reconstructed words.'

There are no reservations as far as Kim's (2002) account of the acrostatic and amphikinetic patterns is concerned. However, in order to account for the proterokinetic and hysterokinetic patterns, he must resort to a reanalysis of the morphological composition of the respective nouns. In our opinion, Frazier's (2006) criticism of this move is quite convincing.

4.3 OT account in Frazier (2006)

Frazier (2006) seeks to improve on Kim's analysis of the accentuation of athematic nouns in Indo-European by employing the Optimality Theory framework in its correspondence version (McCarthy & Prince, 1995). As before, we assume that the reader is familiar with OT and, more specifically, with Correspondence Theory.

Frazier's assumptions about representations are fairly standard for analyses of free-stress systems. A potential nucleus in a morpheme can be underlyingly specified as accented. In addition, morphemes can be underlyingly specified as post-accenting (stress is attracted to the following syllable) or pre-accenting (stress is attracted to the preceding syllable). The remaining morphemes lack accentual specification. We begin our overview of Frazier's account with the analysis of the accentuation of weak case forms.

4.3.1 Weak cases

4.3.1.1 Amphikinetic nouns

In the weak cases of amphikinetic nouns, stress falls on the ending. The root and the suffix are assumed to be underlyingly unaccented while the ending is underlyingly accented. This is similar to Halle's (1997) analysis of an analogous stress alternation in non-derived nouns in Russian and Kim's (2002) analysis of the IE amphikinetic class.

Frazier employs the following faithfulness constraints originally formulated in Alderete (1999):

(1) Accentual faithfulness constraints

- IO-MAX(ACCENT) [MAX(A)] – Do not delete accent; every accent *a*i should have a correspondent *a*o. Assign a * for every *a*i that has no such correspondent.
- IO-DEP(ACCENT) [DEP(A)] – Do not insert accent; every accent *a*o should have a correspondent *a*i. Assign a * for every *a*o that has no such correspondent.
- IO-NOFLOP(ACCENT) [NOFL(A)] – Do not shift accent; for every accent *a*i that is linked to a segment *s*i, if *a*i ℜ *a*o and *a*o is linked to so, then si ℜ so. Assign a * for every *a*i where this is not the case.

The Basic Accentuation Principle (Kiparsky & Halle, 1977) states that IE stress has a preference for the left edge. If an input has no underlyingly accented morpheme, stress will surface on the word-initial syllable; if there is more than one accented morpheme, stress will be assigned to the leftmost accented morpheme. Frazier (2006, p. 45) uses the following alignment constraint to capture the left-edge preference:

- ALIGN-LEFT (σ́, PrWd) [ALIGNL] – For every stressed syllable, align its left edge with the left edge of some prosodic word. Assign a * for each stressed syllable that is not leftmost in the PrWd.

The interaction of the faithfulness constraints with the alignment constraint is illustrated in the tableau below.

Table 4-3: Generation of a weak case form of an amphikinetic noun, reproduced from Frazier (2006: 46)

	/RSÉ[1]/	MAX(A)	DEP(A)	NOFL(A)	ALIGNL
a	Ŕ[2]SE	*(!)	*(!)		
b	Ŕ[1]SE			*!	
c	☞RSÉ				*

In candidate *a*, the stress on the root results from the insertion of stress (hence the correspondence index 2). The insertion violates the constraint DEP(A). The violation of MAX(A) is caused by the fact that the underlying accent on the ending has no correspon-

dent in the output. In candidate *b*, the stress on the root is in correspondence relation with the underlying accent on the ending and thus violates NOFLOP(A). The winning candidate *c* does not violate any faithfulness constraints, while violating the left-edge alignment constraint. Thus, faithfulness to the underlying accent on the ending wins over ALIGNL.

4.3.1.2 Acrostatic nouns

In the stems of acrostatic nouns, roots are underlyingly accented and suffixes are either accented or unaccented. Recall that the weak endings are also accented. The surface form is stressed on the root. To account for this pattern, Frazier (*op. cit.*) introduces a positional faithfulness constraint, $\text{MAX(A)}_{\text{root}}$, and proposes that root faithfulness overrides general faithfulness.

Table 4-4: Illustration of the role of root faithfulness in acrostatic nouns (Frazier, 2006, p. 49)

1) form with an accented case ending

	/ŔSÉ/	$\text{MAX(A)}_{\text{root}}$	MAX(A)	ALIGNL
a	☞ ŔSE		*	
b	RSÉ	*(!)	*	*(!)

2) form in which all the morphemes are accented

	/ŔŚÉ/	$\text{MAX(A)}_{\text{root}}$	MAX(A)	ALIGNL
a	☞ ŔSE		**	
b	RŚE	*(!)	**	*(!)
c	RSÉ	*(!)	**	*(!)

Frazier remarks that, in this particular case, the optimal candidate can be chosen by ALIGNL, which makes $\text{MAX(A)}_{\text{root}}$ redundant for the analysis. At a later point she adduces evidence to support her claim that $\text{MAX(A)}_{\text{root}}$ is crucial. For the time being, let us simply notice that root faithfulness wins over general faithfulness.

The fact that only one underlying accent is realized in the output is captured by the constraint CULMINATIVITY [CULMIN] – A prosodic word (PrWd) has one and only one

prosodic peak. Assign a * if this is not the case (Frazier, 2006, p. 39). As the constraint is undominated, it is omitted from the tableau.

4.3.1.3 Proterokinetic nouns with unaccented roots

The weak case form of proterokinetic nouns are stressed on the suffix. The input of a proterokinetic stem can contain an unaccented root and an accented suffix. The weak endings are underlyingly accented. To account for the choice of the suffix accent over the ending suffix, Frazier proposes that faithfulness constraints be subcategorized not only for roots but also for derivational suffixes:

Table 4-5: Illustration of the role of Max(A) subcategorized for derivational suffixes (Frazier, 2006, p. 50)

	/RŚÉ/	MAX(A)$_{deriv}$	MAX(A)	ALIGNL
a	☞RŚE		*	*
b	RSÉ	*!	*	*

Thus, faithfulness to a derivational affix wins over faithfulness to an inflectional affix. On a more general level, Frazier proposes that all faithfulness constraints in IE are ranked in the following manner: F_{root} >> F_{deriv} >> F.

4.3.1.4 Hysterokinetic nouns and proterokinetic nouns with post-accenting stems

Some morphemes are marked as post-accenting. Post-accenting morphemes trigger the constraint POSTACCENT, or ALIGN (PoAMorph, R, AccMorph, L) – For every post-accenting morpheme, align its right edge with the left edge of some stressed morpheme. Assign a * if stress does not occur on the morpheme immediately following a post-accenting morpheme[4] (Frazier, 2006, p. 54).

Frazier's account of the accentuation of the weak cases of hysterokinetic nouns and proterokinetic nouns with a post-accenting root is illustrated in the tableaux below, where the subscript $_{PA}$ stands for 'post-accenting.'

[4] Note that, in the case of languages that allow polysyllabic suffixes, this constraint cannot on itself determine the actual location of stress within the stressed morpheme.

Table 4-6: The role of post-accentuation in hysterokinetic and proterokinetic nouns

a. Hysterokinetic pattern

	/R_{PA}SÉ/	MAX(A)	NOFL(A)	POSTACC	ALIGNL	DEP(A)$_{deriv}$	DEP(A)
a	RŚ^{2}E	*(!)			*	*(!)	*(!)
b	RŚ^{1}E		*!		*		
c	☞RSÉ			*	*		

b. Proterokinetic pattern:

	/R_{PA}ŚÉ/	MAX(A)$_{deriv}$	MAX(A)	POSTACC	ALIGNL
a	☞RŚE		*		*
b	RSÉ	*(!)	*	*(!)	*

In the first tableau, stress is assigned to the only underlyingly accented morpheme (the ending). In the second tableau, suffix faithfulness wins over general faithfulness; as a result, the suffix gets stress. In both cases, POSTACC is dominated by faithfulness constraints; in fact, Frazier remarks that the constraint does not 'do any work' in the weak cases; however, its importance will be shown for the analysis of the accentuation of the strong cases of hysterokinetic nouns.

4.3.2 Strong cases

4.3.2.1 Proterokinetic nouns

Frazier (2006) observes that the strong cases of proterokinetic nouns are problematic for the constraint rankings she proposes. If the stem is formed by an unaccented root and an accented suffix, then MAX(A)$_{deriv}$ will enforce suffixal stress both in the weak and in the strong cases, which is contrary to the facts. In order to solve the problem, a combination of Anti-Faithfulness (Alderete, 1999 [2001]) and Optimal Paradigms (McCarthy, 2005) is used. Anti-Faithfulness was originally formulated to account for the fact that some affixes used in derivation introduce mutations in the derivational base, while other do not. Base-mutating affixes (labelled 'dominant' as opposed to 'recessive') trigger *anti-*

faithfulness constraints, which require that there should be a violation of the respective output-output faithfulness constraints in the string corresponding to the base. Below we reproduce one of the Anti-Faithfulness constraints formulated in Alderete (1999):

- ¬ OO-MAX(Accent) – An output has (at least) one accent *a*o that has no correspondent *a*b in the base. Assign a * if every *a*o has a correspondent.

Anti-faithfulness constraints are explicitly formulated as output-output constraints, and therefore their application to inflectional affixes is questionable (since the IE stem never surfaces as a separate word, without some inflectional endings). [5] Frazier proposes that, along with Transderivational Anti-Faithfulness constraints, there are anti-faithfulness constraints formulated for Optimal Paradigms (OP). Such constraints would require a violation of OP faithfulness whenever inflectional endings indexed as dominant are attached to the stem. Consider this example of an OP faithfulness constraint (Frazier, 2006, p. 76):

- OP-NOFLOP(A) – Do not shift stress in any member of an inflectional paradigm. For every accent *a*n in a member of an inflectional paradigm that is linked to a segment *s*n, if *a*n has a correspondent, this correspondent should be linked to the correspondent of *s*n in any other member of the inflectional paradigm. Assign a * if this is not the case.

The corresponding anti-faithfulness constraint for Optimal Paradigms is formulated as the logical negation of its faithfulness counterpart (*ibid.*):

- ¬ OP-NOFLOP(A) – Shift accent in some member of an inflectional paradigm. There should be one accent *a*n such that *a*n has a correspondent and that *a*n and its correspondent are linked to non-corresponding segments. Assign a * if this is not the case.

In the Optimal Paradigms model, output candidates consist of entire paradigms. Violations of input-output correspondence constraints incurred by all members of a given candidate paradigm are added together. In addition to input-output correspondence, an

[5] Alderete (1999) proposes that output-output correspondence relations can be established between word forms that are morphologically but not derivationally related, e.g. between singular and plural forms of nouns.

output-output correspondence relation ($\mathfrak{R}_{OP}$) is established between the output of the shared stem in each member of a given paradigm and the outputs of the shared stem in all the other members of the paradigm. The respective OP correspondence constraints compare each member of a paradigm to each other member in a bidirectional way, so no single member of the paradigm constitutes the base.

In the Anti-Faithfulness for Optimal Paradigms model, a correspondence relation ($\mathfrak{R}_{\neg\ OP}$) is established between the stem in each paradigm member inflected with a dominant affix and the stem of each paradigm member inflected with a recessive affix (Frazier 2006, p. 69). Anti-faithfulness constraints as used in this model (¬ OP constraints) compare the respective outputs in a unidirectional manner: forms with dominant affixes are compared with forms with recessive affixes, but not the other way round.

The tableau below, reproduced from Frazier (2006, p. 78), illustrates the operation of Anti-Faithfulness for Optimal Paradigms in the analysis of the inflectional paradigm of proterokinetic nouns with an unaccented root and an accented suffix (RŚ). The analysis is conducted under the assumption that the strong case endings are dominant and the weak case endings are recessive. In the tableau, the author shows that the shift caused by the dominant endings follows from the undominated position of the anti-faithfulness constraint ¬ OP-NOFLOP(A) (note the correspondence indices).

First, however, we would like to make one remark. The candidate sets evaluated in the tableau contain only one weak form. In our opinion, this is unfortunate, since it follows from the definition of ¬ OP-NOFLOP(A) that it is satisfied by an accent shift in any single weak form (‘Shift accent in some member of an inflectional paradigm’ = ‘Shift accent in at least one member of an inflectional paradigm’). If taken literally, the constraint cannot possibly assign more than one violation mark per dominant suffix. Correspondingly, unless we are mistaken, this constraint is unable to choose among member sets that have at least one weak form with a shifted accent. As far as the constraint is concerned, a candidate set in which there is an accent shift in all the weak forms (presumably, the winning set) is not any better than one in which there is an accent shift in a single weak form only. In our opinion, the inclusion of at least two weak forms in the candidate sets evaluated in the tableau is essential. However, the tableau is reproduced as is.

Table 4-7: Proterokinetic noun (RŚ type) *mentis* 'thought' Nom., Gen., Acc. Sg (Frazier, 2006, p. 78)

/men-té[1]y/+ [s_{dom}, m_{dom}, $és_{rec}$ …]		¬OP-NOFLOP(A)	OP-NOFLOP(A)	¬OP-DEP(A)	OP-DEP(A)	¬OP-MAX(A)	OP-MAX(A)	$NOFLOP(A)_{deriv}$	NOFLOP(A)	$MAX(A)_{deriv}$	MAX(A)	ALIGNL	$DEP(A)_{root}$	DEP(A)
a	☞<mé[1]ntis, mé[1]ntim, mn̥té[1]ys>		** **	**		**		**	**			*		
b	< mn̥té[1]ys, mn̥té[1]yn̥, mn̥té[1]ys >	** !		**		**						***		
c	<mé[2]ntis, mé[2]ntim, mn̥té[1]ys>	** (!)			** (!)		** (!)			** (!)	** (!)	*	** (!)	** (!)

4.3.2.2 Amphikinetic nouns

The initial stress in the strong cases of amphikinetic nouns follows from the ranking ALIGN L > $DEP(A)_{Root}$. The Anti-Faithfulness constraint ¬ OP-NOFLOP(A) cannot play any role here, because the weak case forms are stressed on the ending, which lies outside of the shared stem. That is to say, there is nothing to shift in order to satisfy the anti-faithfulness constraint. Below we reproduce a simplified evaluation tableau of the respective paradigm. In the tableau, candidates *a*, *b*, and *c* represent the strong cases; the bottom left cell shows the output of the stem in the weak forms 'as a representation of the recessive candidates that the dominant candidates are being compared to through the ¬ OP constraints' (Frazier, 2006, pp. 79,81).

Table 4-8: Amphikinetic nouns (RS type)

	/RSE$_{dom}$/	¬OP-NoFlop(A)	¬OP-Max(A)	¬OP-Dep(A)	AlignL	Dep (A)$_{root}$	Dep (A)$_{deriv}$	Dep (A)
RS	a ☞ ŔSE	*	*			*		*
	b RŚE	*	*		*!		*	*
	c RSÉ	*	*	*(!)	*(!)			*

4.3.2.3 Hysterokinetic nouns

Again, anti-faithfulness constraints do not play a role here, for stress in the weak cases falls on the ending, and thus no stress shift is required within the stem (recall that both OP and ¬ OP constraints compare only the string shared by all the members of a given paradigms – that is, the stem).

The input of hysterokinetic stems contains a post-accenting root and an unaccented suffix. The location of stress on the suffix follows from the ranking PostAccent > Align-L, as can be seen in the tableau below.

Table 4-9: Hysterokinetic noun ($R_{PoA}S$ type), reproduced from Frazier (2006, p. 82)

	/R$_{PoA}$SE$_{dom}$/	¬OP-Dep(A)	¬OP-Max(A)	¬OP-NoFlop(A)	PostAcc	AlignL	Dep (A)$_{root}$	Dep (A)$_{deriv}$	Dep (A)
RS	a ☞ RŚE		*	*		*		*	*
	b ŔSE		*	*	*!		*		*
	c RSÉ	*(!)	*	*	*(!)	*			*

4.3.2.4 Acrostatic nouns and summary

Acrostatic nouns are stressed on the root in all the case forms. This means that, in the case of an acrostatic stem composed of an accented root and an unaccented suffix, root faithfulness outranks the Anti-Faithfulness for OP constraint ¬ OP-NOFL(A), which requires a stress shift within the stem: NOFL(A)root >> ¬ OP-NOFL(A). In acrostatic stems composed of an accented root and an accented suffix, MAX(A)$_{root}$ outranks all the constraints that could either cause a stress shift or choose the suffixal accent.

The big advantage of Frazier's (2006) analysis is that it does not invoke the otherwise unmotivated morpheme fusion proposed by Kim (2002). Her analysis, however, relies on non-standard OT extensions like Anti-Faithfulness and Optimal Paradigms. It is especially disconcerting that the 'heavy artillery' of Anti-Faithfulness for Optimal Paradigms is only (!) needed for the analysis of the accentuation of the strong cases of proterokinetic nouns. Thus, an entire new class of constraints is introduced to analyze a relatively small portion of the data.

4.4 A tonal reanalysis

In this section, we develop a strictly tonal account of the accentual patterns of athematic nouns in Indo-European. The basic assumption of our approach is that the accentual properties of morphemes are encoded in the input by means of tone. Inputs of all morphemes either have an underlying tone or are toneless. In most cases, morphemes have a high rather than low tone in the input, as it is high tone that is marked in surface forms. An underlying tone can be either pre-linked to a particular position within its source morpheme or floating. The output of every phonological word must have one and only one high tone associated with one of its tone bearing units. This requirement is captured by the constraint CULMINATIVITY:

- CULMINATIVITY [CULMIN] (as formulated in Alderete, 1999) – A prosodic word (PrWd) has one and only one prosodic peak. Assign a * if this is not the case.

As Frazier (2006) correctly points out, CULMINATIVITY can be split into two constraints: one that penalizes having no stress (in our terms, no high tone) and another one that penalizes having more than one stress (tone); a similar observation is made by Hyman (2006). For our purposes, it will not be necessary to distinguish these two

aspects of CULMINATIVITY. In general, however, it should be born in mind that the constraint is violated either by a form with no peak or with a form with more than one peak. In Indo-European, this constraint is undominated.

Another constraint that is undominated in the IE material in question is *DISASSOCIATE.

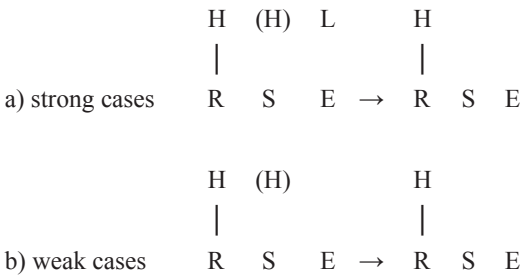
- *DISASSOCIATE [*DISASSOC] (YIP, 2002) – No removal of association lines.

Our analysis of IE athematic nouns does not involve such tonal processes as tone fusion, metatony, and so on. The respective constraints are also undominated and will be ignored in the ensuing discussion.

4.4.1 Acrostatic nouns

We begin with an application of our analysis to acrostatic nouns. Recall that acrostatic nouns are characterized by a fixed root stress in all the declension forms (here and elsewhere the term 'stress' as applied to Indo-European is used informally to refer to the output location of high tone). We propose that the inputs of the roots of acrostatic nouns have a pre-linked high tone. The constraint against the delinking of tone (*DISASSOC) being undominated, this pre-linked high tone is outputted faithfully. Due to CULMINATIVITY, the tonal specification of the remaining morphemes is of no consequence (provided that none of the ensuing morphemes has a pre-linked tone in the input), as there can be one and only one high tone per phonological word. Below we represent the input-output mapping posited for acrostatic nouns.

Figure 4-7: Input-output mappings posited for acrostatic nouns



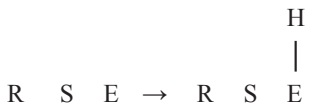
Roots of acrostatic nouns have a pre-linked high tone in the input. The inputs of strong case endings contain a low tone (the relevance of this proposal will become clear when we discuss other accentual patterns). Any output TBU that does not bear a high tone is assigned the default low tone. In our representations of output forms, we do not show the default low tone. The inputs of suffixes of acrostatic nouns are assumed to be either toneless or containing a floating high tone. As we have remarked, this tone does not get associated due to the fact that the input already contains one associated tone.

The inputs of the weak case endings differ from those of the strong cases with respect to their tonal specification: they are unspecified for tone. Compare this to Kim (2002), where the weak endings are specified as projecting a left boundary on line 0, and to Frazier (2006), where weak endings are assumed to be underlyingly accented or pre-accenting.

4.4.2 Amphikinetic nouns

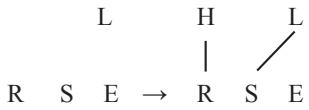
In the strong case forms of amphikinetic nouns, high tone is realized on the root, and in the weak forms – on the ending. We propose that the stems of such nouns are composed of a toneless root and a toneless suffix. Assuming that the inputs of inflectional endings do not sponsor a high tone, the only way to supply a prominence peak to an amphikinetic noun is through the insertion of a high tone. The insertion violates DEP(H), which militates against the insertion of high tone, and *ASSOC, a constraint prohibiting the creation of new association lines: CULMIN >> DEP (H) and CULMIN >> *ASSOC. We propose that the weak endings are toneless. Correspondingly, the entire input of a weak case form of an amphikinetic noun is toneless:

Figure 4-8: Input-output mapping of the weak case forms of amphikinetic nouns:



A high tone is inserted and aligned with the right edge of the word. The respective alignment constraint ALIGN-R (H, PrWd) requires that the right edge of a high tone be aligned with the right edge of the prosodic word. This constraint is violated in the strong cases of amphikinetic nouns:

Figure 4-9: Input-output mapping of the strong case forms of amphikinetic nouns:



We propose that the strong endings contain an underlying low tone and that this low tone is outputted on the suffix, thereby limiting the possible docking positions of the high tone inserted by the grammar to the root. Why is the low tone realized on the suffix rather than on its source morpheme? One of the properties of Indo-European ablaut is that 'proper' nuclei – that is to say, /e/ and /o/ in the full grade or the lengthened grade – appear mostly under stress. When unstressed, they tend to surface in the so-called zero-grade. The strong endings of the singular paradigm of athematic nouns are always realized in the zero-grade. Considering this fact, we propose that the inputs of these endings actually lack vocalic material altogether (if ablaut is seen as an allomorphic phenomenon, then the endings can be said to lack allomorphs with vocalic material). As a consequence, the low tone sponsored by these endings can only be outputted on another morpheme, if at all.[6] This solution is challenged by the nominative plural ending *-es*, which, although never stressed, is reconstructed with a vowel. Under an analysis which sees ablaut as a synchronic process depending on the location of ictus, this ending constitutes an exception. For the purposes of the grammar we have proposed, the ending must also be analyzed as exceptionally extratonal. Just like the other strong endings, it contains a floating low tone in the input; this tone, however, can never be realized on the ending itself.

If our proposal concerning the inability of the strong case endings to bear tone is correct, then an inserted high tone can only surface either on the suffix or on the root. In previous analyses, the word-initial location of word prominence in the strong cases of amphikinetic nouns was explained by invoking the Basic Accentuation Principle. On the face of it, the operation of the BAP can be mimicked by alignment. Indeed, a word-initial high tone satisfies the alignment constraint ALIGN-L (H, PrWd): Align the left edge of a high tone with the left edge of a prosodic word. It turns out, however, that, in our model, this constraint does not play a role in the choice of the optimal candidate. In the tableau below, the acute symbol (´) marks the location of high tone, the grave symbol

[6] This statement is probably too strong, as the accusative singular ending *-m* can in fact be syllabic in the output and can, in principle, carry tone.

(`) marks low tone which is in correspondence with the input low tone, the default low tone in unstressed positions is not marked.

Table 4-10: Evaluation of the strong case forms of amphikinetic nouns

	L RSE	CULMIN	DEP(T)	MAX(T)	ALIGN-R (H, PrWd)	ALIGN-R (H, stem)	ALIGN-L (H, PrWd)
a	☞ŔS̀E		*		*	*	
b	RS̀E	*!			*		*
c	☞ŔSE		*		*		*
d	RSE		*	*!	*		*

None of the candidates satisfies the highest-ranked alignment constraint ALIGN-R (H, PrWd), which means that alignment is irrelevant.[7] Candidate *b* lacks a high tone, thus fatally violating CULMINATIVITY. Candidate *d* does not contain a correspondent of the input low tone. In candidate *a*, a high tone is inserted on the root, and the underlying low tone is realized on the suffix. In candidate *c*, a high tone is inserted on the suffix, and the underlying low tone is realized on the root. The two candidates tie on faithfulness constraints. In order to correctly choose candidate *a*, the grammar should be able to prevent the low tone sponsored by the ending from surfacing on a non-adjacent morpheme. This can be achieved by aligning tone with its source morpheme: Align- L/R (H, source) – Align the left/right edge of a tone with the right/left edge of its source morpheme. This constraint is satisfied whenever tone is realized on the source morpheme or is adjacent to the source morpheme. In the case in question, it will correctly choose candidate *a* over candidate *c*.

Holokinetic nouns constitute a subgroup of amphikinetic nouns. Recall that the accentuation of holokinetic nouns is identical to that of amphikinetic nouns in all the case forms except for the locative. Locatives of holokinetic nouns do not have an overt ending and are stressed on the suffix. Under the competing analyses, the suffixal stress is unexpected, because stems without an underlying accent are supposed to receive the default word-initial stress. Kim (2002) proposes that the exceptional locative forms

7 The ranking of the alignment constraints below ALIGNR (H, PrWd) follows from the fact that a high tone inserted on weak case forms of amphikinetic nouns is aligned with the right edge of the word rather than the right edge of the stem or the left edge of the word.

contain an underlyingly accented zero-ending. Stress is assigned to the ending and next is retracted onto the preceding syllable. Frazier (2006) explains the 'odd behaviour' of holokinetic nouns by positing that the zero locative case ending is a pre-accenting morpheme. Under our analysis, the analysis of uninflected locatives does not differ in any way from the analysis of other weak case forms. Because the stem is toneless, a high tone is inserted and aligned with the right edge of the word, just like in the inflected weak case forms of amphikinetic nouns. The only difference lies in the fact that the rightmost morpheme of uninflected locatives is a stem suffix, whereas in other weak case forms the rightmost morpheme is an inflectional ending.

Table 4-11: Evaluation of inflected weak forms of amphikinetic nouns

	RSE	CULMIN	DEP(T)	MAX(T)	ALIGN-R (H, PrWd)	ALIGN-R (H, stem)	ALIGN-L (H, PrWd)
a	☞RSÉ		*			*	*
b	ŔSE		*		*!	*	
c	RŚE		*		*!		*

The output of an uninflected locative is not exceptional in any way. Moreover, it is more harmonic than the output of an inflected weak form, as it simultaneously satisfies both ALIGNR (H, PrWd) and AlignR (H, Stem).

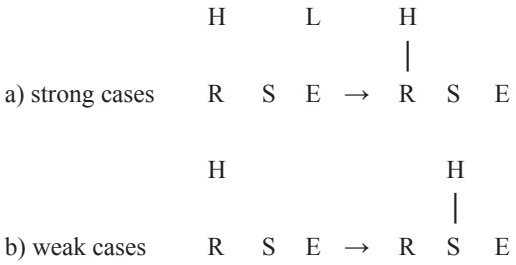
Table 4-12: Evaluation of uninflected locatives of the holokinetic subgroup

	RS	CULMIN	DEP(T)	MAX(T)	ALIGN-R (H, PrWd)	ALIGN-R (H, Stem)	ALIGN-L (H, PrWd)
a	☞RŚ		*				*
b	ŔS		*		*!	*	

4.4.3 Proterokinetic nouns

Recall that high tone surfaces on the root in the strong cases of proterokinetic nouns and on the suffix in the weak cases. We analyze the inputs of proterokinetic nouns as containing a toneless suffix and a non-associated high tone on the root.

Figure 4-10: Input-output mapping of proterokinetic nouns



In the strong cases, the high tone sponsored by the root becomes associated to its sponsor. In the weak cases, the high tone is shifted one position to the right onto the suffix. Why is there a rightward tone shift from the roots of proterokinetic but not of acrostatic nouns? The decisive factor is the different association status of the underlying high tone: it is pre-linked in the inputs of acrostatic nouns, but floating in the inputs of proterokinetic ones. As *DISASSOC is ranked high, the only way to move the high tone of acrostatic nouns rightwards would be to spread it by creating an additional association line to the next TBU. The spreading of tone is blocked by the constraint against the association of tone to more than one tone bearing unit (NOLONGT – see Yip, 2000). As a result, high tone in acrostatic nouns remains associated to the root. In proterokinetic nouns, *DISASSOC applies vacuously, for the underlying high tone sponsored by the root is not associated, and thus is free to move.

Now that we have explained under what conditions tone can shift, let us put the next question: why does it shift? Observe that, as a result of the rightward shifting of high tone in the weak cases of proterokinetic nouns, tone is aligned with the right edge of the stem. We propose that an alignment constraint requiring that high tone be aligned with the right edge of the stem is responsible for the shift:

- ALIGN-R (H, stem) – Align high tone with the right edge of the stem.

The action of this constraint is comparable to the Oxytone Rule independently proposed for Indo-European by Kiparsky (2010a): 'accent the rightmost syllable of an inflectional stem.' This constraint outranks the alignment constraint which requires that high tone be aligned with the left edge of the respective prosodic word:

- ALIGN-L (H, PRWD) – Align high tone with the left edge of the prosodic word

Another constraint outranked by ALIGN-R (H, Stem) is TRUE-TO-SOURCE,[8] which requires tone to be associated to its source morpheme. Given our analysis of the weak forms of amphikinetic nouns, ALIGN-R (H, Stem) is ranked lower than ALIGN-R (H, PrWd). However, the high tone would no longer be adjacent to its source morpheme, if realized at the right edge of the word (on the ending). The alignment constraint requiring adjacency to the source, Align-L/R (H, Source) is undominated.

The next question we have to consider is why there is no shift in the strong cases of proterokinetic nouns. In our analysis of amphikinetic nouns, we propose that the inputs of the strong case endings contain a floating low tone and that the endings themselves cannot host this tone because they do not contain any vocalic material (or do not have allophones with 'proper' vowels). Given this analysis, the high tone sponsored by the root of a proterokinetic noun and the low tone sponsored by the ending are competing for the suffix.

Table 4-13: Evaluation of the strong case forms of proterokinetic nouns

	H L RSE	CULMIN	ALIGN-L/R (T, Source)	MAX(T)	ALIGN-R (H, PrWd)	ALIGN-R (H, Stem)	ALIGN-L (H, PrWd)
a	☞ŔS̀E				*	*	
b	RS̀E	*!		*			
c	ŔŚE		*!		*		*
d	RŚE			*!	*		*

There are two candidates that satisfy MAXT. In candidate *a*, the high tone is realized on its source morpheme, and the low tone is minimally displaced. Both tones are aligned with the edges of their respective source morphemes in satisfaction of Align-L/R (T, Source). In candidate *c*, only the high tone is aligned with its source, whereas the low tone is not adjacent to its source morpheme.

As far as the weak case forms are concerned, faithfulness no longer plays an important role, as none of the most harmonic candidates violates MAX(T). As before, we do not mark the default low tone in 'unstressed' positions in the tableau below.

[8] The constraint was introduced in our discussion of Belarusian stress.

Table 4-14: Evaluation of the weak case forms of proterokinetic nouns

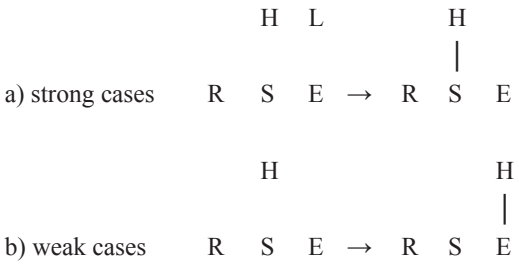
	H RSE	CULMIN	ALIGN-L/R (T, Source)	MAX(T)	ALIGN-R (H, PrWd)	ALIGN-R (H, Stem)	ALIGN-L (H, PrWd)
a	ŔSE				*	*!	
b	☞RŚE				*		*
c	RSÉ		*!			*	*

The most unmarked realization of the underlying high tone would be at the right edge of the word. However, tone cannot skip morphemes in order to satisfy word-edge alignment: it is blocked by the requirement to be aligned with the edges of its source morpheme, so candidate *c* is untenable. Neither of the remaining candidates *a* and *b* satisfies ALIGN-R (H, PrWd), so the choice between them is made by the lower alignment constraint ALIGN-R (H, Stem).

4.4.4 Hysterokinetic nouns

In the outputs of hysterokinetic nouns, high tone is realized on the suffix in the strong cases and on the ending in the weak cases. We propose that the roots of such nouns are toneless, and the suffixes contain a non-associated high tone.

Figure 4-11: Proposed inputs and outputs of hysterokinetic nouns



In the strong case forms, the high tone sponsored by the suffix gets linked to the sponsor. In the weak cases, it is shifted onto the case ending. This shift is caused by the high-ranked requirement to align high tone with the right edge of the word. The fact that a high tone sponsored by the suffix is realized on the ending confirms the ranking ALIGN-

R (H, PRWD) >> ALIGN-R (H, Stem). As shown in the tableau below, hysterokinetic nouns posit a problem for the analysis developed so far.

Table 4-15: Evaluation of the strong case forms of hysterokinetic nouns

	HL RSE	CULMIN	ALIGN-L/R (T, Source)	MAX(T)	ALIGN-R (H, PrWd)	ALIGN-R (H, Stem)	ALIGN-L (H, PrWd)
a	☞ŔS̀E				*	*	
b	☹ RŚE			*!	*		*
c	ŔŚE		*!		*		*

The grammar forces the high tone to shift leftwards in order to satisfy MAX(T) by providing a docking place for the low tone sponsored by the strong case ending. The actual output, which is candidate *b* in the tableau, fails to realize the underlying low tone, while candidate *c* realizes it non-locally.

Heretofore we have established that tone shift in IE is always local in the sense that a displaced tone must be adjacent to its source morpheme. This reminds bounded tone displacement in Bantu languages. It has been reported e.g. for Kikuyu, where tone is realized one TBU to the right of its underlying position (Clements & Ford, 1979; for a recent reanalysis in terms of headed spans see Key, 2007). Hysterokinetic nouns reveal another property of tone displacement in IE: it is directional. A high tone never shifts to the left and only shifts to the right if no [low] tone competes for the same position. This rather straightforward statement, however, is not easily translatable into the alignment constraints we have introduced so far. What we need, is a constraint that would prevent high tone from surfacing to the left of its sponsor:

- ALIGN-L (H, Source, L/R) – Align the left edge of a high tone with the left/right edge of its source morpheme.

In other words, the constraint prefers high tone to be outputted at the beginning of its sponsoring morpheme or at the beginning of the following morpheme. Ranked above Max(T), the constraint will correctly eliminate candidate *a*:

Table 4-16: Modified analysis of the strong cases of hysterokinetic nouns

	HL RSE	ALIGN-L/R (T, Source)	ALIGN-L (H, Source, L/R)	MAX(T)	ALIGN-R (H, PrWd)	ALIGN-R (H, Stem)	ALIGN-L (H, PrWd)
a	ŔS̀E		*!		*	*	
b	☞RŚE			*	*		*
c	ȒŚE	*!			*		*

In the weak forms, the choice of the optimal candidate is determined by alignment with the right edge of the word:

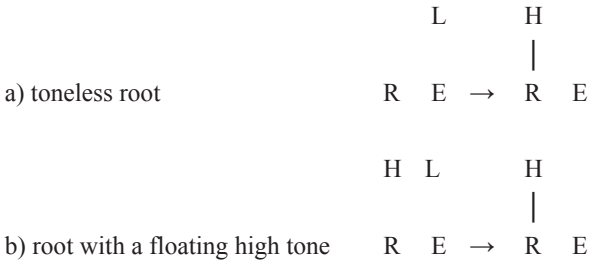
Table 4-17: Evaluation of the weak forms of hysterokinetic nouns

	H RSE	ALIGN-L/R (T, Source)	ALIGN-L (H, Source, L/R)	MAX(T)	ALIGN-R (H, PrWd)	ALIGN-R (H, stem)	ALIGN-L (H, PrWd)
a	ŔSE		*!		*	*	
b	RŚE				*		*
c	☞RSÉ					*	*

4.4.5 Root nouns

Root nouns do not require any special treatment under our analysis. Nouns with a pre-linked high tone in the input behave just like acrostatic nouns: high tone is realized on the root in all the declension forms. If the input of a root contains a floating high tone or no tone, the output high tone will be located on the root in the strong case forms and on the ending in the weak cases.

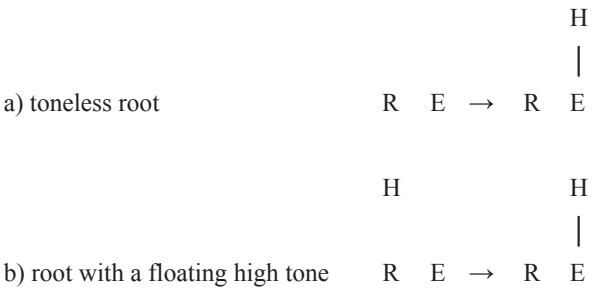
Figure 4-12: Input-output mapping of the strong case forms of non-acrostatic root nouns



When the stem is composed of a toneless root, the grammar inserts a high tone and aligns it with the right edge of the stem (recall that we treat strong endings as having no underlying vocalic material, which means that the high tone cannot be realized on the ending). When the root contains a floating high tone in the input, the grammar associates it to the only docking place available: the root.

The analysis of the weak cases of non-acrostatic root nouns is performed exactly like the analysis of amphikinetic nouns (if the root is toneless) or hysterokinetic/proterokinetic nouns (if the root contains a floating high tone):

Figure 4-13: Input-output mapping of the weak case forms of non-acrostatic root nouns



In the first case, a high tone is inserted on a toneless input and aligned with the right edge of the word. In the second case, the floating high tone sponsored by the root is shifted one position to the right in order to satisfy the same alignment requirement.

It is worth noting that, unlike Frazier, we do not have to posit that root nouns can only be formed by accented roots (in our terms, roots with a pre-linked high tone in the input) and unaccented (in our terms, toneless) roots. Under our analysis, root nouns can be formed by any type of root. In this connection, we would like to consider an apparent lapse in our classification of the stems of athematic nouns. So far, we have discussed the following types of stems: stems whose roots contain a pre-linked high tone (acrostatic); toneless stems (amphikinetic); stems whose roots contain a floating high tone, with a toneless suffix (proterokinetic); stems with a toneless root and a suffix containing a floating high tone (hysterokinetic). There is, however, one more logically possible configuration: stems with two floating high tones, one on the root and another on the suffix. The evaluation of this case is presented in the tableau below:

Table 4-18: The strong forms of stems with two floating high tones in the input

	HHL RSE	CULMINATIVITY	ALIGN-L/R (T, Source)	ALIGN (H, Source, L/R)	MAX (T)	ALIGN-R (H, PrWd)	ALIGN-R (H, Stem)	ALIGN-L (H, PrWd)
a	ŔŚE	*!			*	**	*	*
b	☞ŔȘE				*	*	*	
c	RŚE				**	*		*
d	ȘŚE		*!		*	*		*

The grammar developed in our analysis chooses candidate *b*, in which two of three underlying tones are realized: the high tone sponsored by the root surfaces on its sponsor, and the low tone sponsored by the ending is outputted on the suffix. The floating high tone sponsored by the suffix is deleted. In the next tableau, the weak case forms are evaluated; candidates in which tone is realized non-locally or to the left of its sponsor have been omitted.

Table 4-19: The weak forms of stems with two floating high tones in the input

	HH RSE	CULMINATIVITY	ALIGN-L/R (T, Source)	ALIGN-L (H, Source, L/R)	MAX(T)	ALIGN-R (H, PrWd)	ALIGN-R (H, Stem)	ALIGN-L (H, PrWd)
a	ŔŚE	*!				**	*	*
b	ŔSE				*	*	*	
c	RŚE				*	*		*
d	☞RSÉ				*		*	*

In the winning candidate *d*, the root tone is deleted, and the suffixal tone is realized on the ending. Rather paradoxically, nouns with stems that contain two floating tones in the input apparently follow the amphikinetic pattern, the same as toneless stems. In a way, we have to do with a combination of the proterokinetic and hysterokinetic patterns. In the strong case forms, the grammar deletes the second underlying high tone. It is easy to see that the resulting stem is proterokinetic (a floating high tone on the root and a toneless suffix). In the weak cases, the first high tone is deleted, and the stem becomes hysterokinetic (a toneless root and a suffix with a floating high tone).

4.4.6 Summary of the tonal analysis

Let us recapitulate the properties of the representations and grammar developed in our analysis. High tone is present not only in the output, where it is culminative and thus marks the locus of prominence, but also in the input. The input of a given morpheme may contain an associated (pre-linked) tone, a non-associated tone, or no tone.

1) Low tone is assigned by default to those TBUs that have not been assigned a high tone by the grammar. Being the default tone, low tone can only be present underlyingly to encode exceptional patterns.
2) The processing of tone in athematic nouns conforms to the following fundamental principles. Delinking of pre-linked high tone is disallowed. Non-associated high tone undergoes bounded rightward displacement, unless blocked by another tone. If no high tone is present in the input, a high tone is inserted and aligned with the right edge of prosodic word, unless blocked by another tone.

The tonal analysis presented above can successfully account for at least the same range of data as the OT analysis developed by Frazier (2006). Our analysis is superior with respect to representational and processing complexity. As far as the representational advantages are concerned, while some of the representations used in our analysis are comparable to the representations used in Frazier (accented ≈ pre-linked tone; post-accenting ≈ non-associated high tone; unaccented ≈ toneless), our inventory of representational possibilities does not require anything comparable to the class of pre-accenting morphemes (Frazier posits one such morpheme, namely the zero locative ending in holokinetic nouns). Another representational device that we do not need is the division of morphemes into dominant and recessive ones. Frazier's classification potentially results in 10 accentual classes of morphemes: recessive accented, dominant accented,

recessive post-accenting, dominant post-accenting, recessive pre-accenting, dominant pre-accenting, recessive unaccented, dominant unaccented. Our system of representation produces 5 classes: morphemes with a pre-linked high tone, morphemes with a pre-linked low tone,[9] morphemes with a non-associated high tone, morphemes with a non-associated low tone, toneless morphemes.

In addition to a more restrictive system of representation, our analysis also offers a more straightforward input-output mapping:

1) faithfulness constraint do not have to be subcategorized for dominant/recessive morphemes;
2) alignment constraints do not have to be subcategorized for accentual types (there are no special alignment constraints for post-accenting and pre-accenting morphemes);
3) our analysis does not employ any extensions of OT (neither non-standard like Anti-Faithfulness, Optimal Paradigms, Anti-faithfulness for Optimal Paradigms nor standard like Positional Faithfulness).

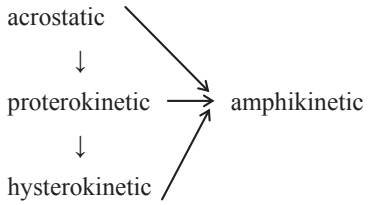
4.4.7 A tonal account of internal derivation

In this subsection, we argue that, apart from being more restrictive and economical (insofar as the term 'economical' can be applied to an OT analysis), our tonal analysis can shed a new light on a rather mysterious aspect of the accentuation of Indo-European athematic nouns: the fixed direction of internal derivation. One of the derivational mechanisms of Indo-European consisted in changing the accentual class of the base word. Frazier cites this example from Watkins (1982): neuter acrostatic nouns formed with the suffix *ew could become adjectives by becoming proterokinetic, e.g. the neuter noun 'good' *wós-u-Ø *nom/acc sg*/ *wés-u-s *gen sg* → the adjective 'good' *wés-u-s *nom sg*/ *us-éw-s *gen sg*. This derivational mechanism is referred to as ***internal derivation***.

[9] Roots/stems with pre-linked tone follow the immovable acrostatic pattern. Suffixes with pre-linked tone correspond to the traditional class of dominant suffixes. Suffixes without tone or with a floating tone in the input correspond to the traditional class of recessive suffixes. A suffix with a pre-linked high tone in the input will realize it in the output thanks to the ban on delinking (if no other morphemes with a pre-linked tone are present) and, if there is another pre-linked tone to their left, thanks to their alignment with the right edge of the stem.

Internal derivation was restricted in the following way: a) any accent class could become amphikinetic;[10] in addition, b) acrostatic nouns could become proterokinetic; c) proterokinetic nouns could become hysterokinetic. No other directions of change were allowed.

Figure 4-14: The attested directions of internal derivation



The fact that any noun can potentially become amphikinetic is interpreted as an indicator that amphikinetic nouns constitute the default accentual class (Frazier, 2006, p. 35) In terms of tonal representations that we have posited, the amphikinetic class of nouns is the only one whose stems are toneless in the input. The stems of all the other types of athematic nouns contain a high tone in the input – either pre-linked or floating. From the point of view of our analysis, an internal derivation resulting in an amphikinetic noun involves the deletion of an underlying high tone:

Figure 4-15: Deletion of input high tone as a method of internal derivation

	H	(H)			
	|				
acrostatic → amphikinetic	R	S	→	R	S
	H				
proterokinetic → amphikinetic	R	S	→	R	S
		H			
hysterokinetic → amphikinetic	R	S	→	R	S

[10] Kiparsky (2010a) refutes the validity of the hysterokinetic → amphikinetic type of internal derivation.

The limitations on the process of internal derivation can be elegantly expressed in terms of tonal representations and operations on tones and/or association lines.

Type of change	**Corresponding operation on tone**
acrostatic → amphikinetic	delinking and deletion of high tone
acrostatic → proterokinetic	delinking of high tone
proterokinetic → amphikinetic	deletion of high tone
proterokinetic → hysterokinetic	local rightward displacement of high tone
hysterokinetic → amphikinetic	deletion of high tone

The only operations allowed in the course of internal derivation are delinking, deletion and rightward displacement of high tone.[11] Now we can see why internal derivation cannot result in an acrostatic noun. Any derivation of the amphikinetic → acrostatic type would involve the insertion of a tone and the creation of an association line. A hysterokinetic → acrostatic derivation would involve the creation of an association line. A hysterokinetic → proterokinetic derivation would involve a leftward (rather than rightward) displacement of tone.

[11] Kiparsky (2010a) comes to a somewhat similar conclusion. Given his reconstructions and analysis, the phonology of internal derivation consists in the deletion of underlying accents (deaccentuation) accompanied with the Oxytone Rule.

5. The Rhythmic Law and other length alternations in Slovak

5.1 Length alternations in Slovak

5.1.1 The Rhythmic Law and the scope of its application

One of the most intriguing phenomena in Slavic is the so-called Slovak Rhythmic Law, analyzed, among others, in Kenstowicz & Rubach (1987), Rubach (1993), and Bethin (1998). For a comprehensive overview of the phonology of Slovak the reader is referred to Rubach (1993). Our discussion will be limited to length alternations in Slovak, and in particular to the Rhythmic Law.

The Rhythmic Law shortens a long nucleus preceded by another long nucleus. For the purposes of the Rhythmic Law and other length alternations in Slovak, a long nucleus is defined as one containing a long monophthong, a diphthong, or a long syllabic liquid. The effects of the rule can be observed primarily on inflectional suffixes, although some derivational suffixes also show its effects. Below are examples from Kenstowicz & Rubach (1987). All the forms are spelling forms with inflection boundaries marked with a dash (-). The acute symbol (´) over letters in Slovak spelling marks long vowels/liquids.

Table 5-1: Examples illustrating the Rhythmic Law in the declension of neuter nouns

Gloss	NOM. SG	GEN. SG	NOM./ ACC. PL.	DAT. PL.	LOC. PL.
town	mest-o	mest-a	mest-á	mest-ám	mest-ách
letter	písmen-o	písmen-a	písmen-á	písmen-ám	písmen-ách
chisel	dlát-o	dlát-a	dlát-a	dlát-am	dlát-ach
wine	vín-o	vín-a	vín-a	vín-am	vín-ach

Plural endings that contain long vowels are shortened, if directly preceded by a long nucleus in the stem. The endings are not shortened after monosyllabic roots with short nuclei or after a disyllabic stem, if the second syllable of the stem is short.

The effects of the Rhythmic Law can also be seen in the dative and locative plurals of feminine nouns:

Table 5-2: Rhythmic Law in the declension of feminine nouns

Gloss	NOM. SG	GEN. SG	DAT. PL.	LOC. PL.
woman	žen-a	žen-y	žen-ám	žen-ách
street	ulic-a	ulic-e	ulic-iam	ulic-iach
suffering	muk-a	muk-y	muk-ám	muk-ách
candle	sviec-a	sviec-e	sviec-am	sviec-ach
flour	múk-a	múk-y	múk-am	múk-ach

Again, inflectional endings with the underlyingly long vowel //a:// can realize length on the surface only if the last nucleus of the root/stem is short. If this condition is not met, i.e. if the last nucleus of the stem is long, the endings surface with a short [a]. In the declension forms of *ulica*, the dative and locative plural endings surface with a diphthong: *-iam, -iach*. Here we are dealing with a positional variant of the long realization of the endings after a palatalized consonant. Note that in *svie**c**am*, where the root ends in the same affricate as in *uli**c**iam* but contains a diphthong in the nucleus, the inflectional ending contains a non-diphthongized short vowel.

Apart from noun inflection, the operation of the Rhythmic Law is also seen on long declensional endings of adjectives, ordinal numerals, and participles declined by certain adjectival models. The table below illustrates the declension of the adjectives *dobrý* 'good' and *múdry* 'wise.' In the table, we use a slash to separate the inanimate/animate forms of the accusative singular and the nominative plural cases of masculine adjectives.

Table 5-3: Examples of the Rhythmic Law in the declension of adjectives

	NOM. SG	GEN. SG	ACC. SG	NOM. PL.	GEN. PL.	INSTR. PL.
MASC.	dobr-ý	dobr-ého	dobr-ý/ého	dobr-é/í	dobr-ých	dobr-ými
	múdr-y	múdr-eho	múdr-y/eho	múdr-e/i	múdr-ych	múdr-ymi
NEUT.	dobr-é	dobr-ého	dobr-é	dobr-é	dobr-ých	dobr-ými
	múdr-e	múdr-eho	múdr-e	múdr-e	múdr-ych	múdr-ymi
FEM.	dobr-á	dobr-ej	dobr-ú	dobr-é	dobr-ých	dobr-ými
	múdr-a	múdr-ej	múdr-u	múdr-e	múdr-ych	múdr-ymi

In contrast to nouns, adjectival inflectional endings with underlyingly long vowels are present both in the plural and in the singular paradigms. Long endings are shortened without exception in the presence of a long nucleus in the immediately preceding syllable of the root/stem.

The Rhythmic Law is also operative in verb conjugation, formation of participles and adverbial participles. Examples of conjugational forms are presented in the table below.

Table 5-4: Rhythmic Law in conjugation

Gloss	**Infinitive**	**1st p. SG**	**2nd p. SG**	**3rd p. SG**	**1st p. PL.**	**2nd p. PL.**
do	robiť	rob-ím	rob-íš	rob-í	rob-íme	rob-íte
praise	chváliť	chvál-im	chvál-iš	chvál-i	chvál-ime	chvál-ite
call	volať	vol-ám	vol-áš	vol-á	vol-áme	vol-áte
proclaim	hlásať	hlás-am	hlás-aš	hlás-a	hlás-ame	hlás-ate

The conjugational endings surface with a long vowel when following a short syllable and with a short one when following a long syllable. Exceptions from the application of the Rhythmic Law to declensional and conjugational endings are not many; we shall mention them when enumerating other exceptions.

Apart from inflectional endings, there are also some derivational suffixes that are subject to shortening under the Rhythmic Law. One such suffix is the agentive nominal suffix *-ník*, which appears in the shortened form *-nik* after long nuclei. Another suffix of this kind is the diminutive suffix *-ík/-ik*.

(1) Rhythmic Law in derivational suffixes

-ník:	rol-ník;	slobod-ník;	stráž-nik;	papier-nik
Gloss	farmer	lance-corporal	guard	stationer

-ík:	voz-ík;	les-ík;	kút-ik;	kocúr-ik;
Gloss	cart	grove, forest	nook	tomcat

For a more detailed list of suffixes, readers are referred to *Pravidlá slovenského pravopisu* (2000), the normative compendium of the Slovak spelling. Some of the controversies associated with the newly introduced norms concerning the application of the Rhythmic Law will be touched upon at a later point.

5.1.2 Metrical and non-metrical analyses of the Rhythmic Law

Kenstowicz and Rubach (1987) analyze the Rhythmic Law as a cyclic rule formulated in terms of x-slots:

Figure 5-1: The Rhythmic Law as a cyclic rule

Rubach (1993) develops this analysis in his comprehensive monograph on the phonology of Slovak written in the framework of lexical phonology. An OT account of the Rhythmic Law in Central Slovak dialects is developed in Mellander (2003). He analyses the progressive shortening under the Rhythmic Law as a metrical process. In a sequence of two syllables with long nuclei HH, the second syllable is shortened due to the preference for uneven trochaic feet: HH → (HL). The pivotal constraint employed in this analysis is Head Prominence (HD-PROM):

(2) HD-PROM[12]:

The head of a foot is intrinsically prominent.

According to Mellander, 'HD-PROM requires the head syllable of a foot to be more prominent than a dependent syllable, and appeals to the intrinsic prominence of heavy syllables in contrast to their light counterparts' (*op. cit.*, p. 248). Another constraint relevant for the account is WEIGHT-IDENTITY-IO:

[12] See Mellander (*ibid.*) for references concerning this constraint and other constraints employed in the analysis.

(3) WT-IDENT-IO:

> A segment is associated to the same number of moras in the input as in the output.

The ranking HD-PROM >> WT-IDENT-IO in combination with the appropriate alignment and other footing constraints results in the creation of syllabic trochees headed by heavy syllables (HL). As we have noted above, a sequence of two long syllables HH is parsed as (HL) in order to satisfy HD-PROM; similarly, LHHL is rendered as (L)(HL)(L), and so on. A sequence of two short syllables LL is prevented from surfacing as (HL) by ranking the faithfulness constraint DEP-μ, which militates against the insertion of moras, higher than HD-PROM. Correspondingly, the constraint MAX-μ, which prevents the deletion of moras, is ranked lower than HD-PROM: moras may be deleted but not inserted in order to create the preferred uneven trochaic foot.

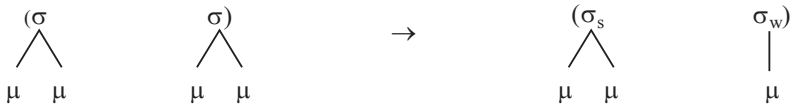
Mellander (*op. cit.*) mentions the description of Central Slovak stress in Stanislav (1958) in support of this footing. According to Stanislav as reported by Mellander (2003, p. 262), the stress system of this dialect is as follows: 'initial main stress with secondary stresses on following odd-numbered syllables, except where a heavy syllable is in an even-numbered position; then secondary stress resumes at an even distance from the heavy syllable.' Mellander states that 'The absence of stress on odd-numbered syllables which immediately follow heavy syllables can be explained by assuming that the two syllables form an uneven (HL) trochaic foot' (*ibid.*). In a sequence like ('L)(HL)(ˌHL) the second foot remains unstressed due to a constraint against stress clash.

Leaving aside various theoretical issues that arise in connection with Mellander's account, and in particular the need to significantly modify Hayes' theory in order to accommodate uneven trochee, one should admit that his analysis successfully avoids circularity in explaining the Rhythmic Law. However, Dogil *et al.* (1999, pp. 826-827) describe stress in Standard Slovak as based on quantity-insensitive syllabic trochee and iterative footing. If this is indeed the case, then the applicability of Mellander's analysis to Standard Slovak becomes questionable. One way to circumvent the problem would be to posit uneven trochee on the lexical level and standard syllabic trochee on the post-lexical level. Of course, in this case the advantage of having a non-circular account of the Rhythmic Law is lost: the Rhythmic Law is explained by a preference for (HL) footing, while (HL) footing is invoked to explain the Rhythmic Law.

The treatment of diphthongs, which are involved in the Rhythmic Law, may also prove problematic. Mellander (2003) treats all diphthongs as heavy. However, it is well established that Slovak diphthongs are phonetically short (Bethin, 1998). Under Mellander's analysis, the surface brevity of diphthongs has to be treated as a result of some kind of a phonetic implementation phenomenon, that is, diphthongs must be phonologically long both in the input and in the output. Otherwise the output parsing ('L)(HL)(,HL), in which the unstressed (HL) foot corresponds to a HH sequence in the input and is headed by a syllable containing a diphthong, will violate the very HEADPROM constraint that has been so crucial in effecting this parsing. Indeed, if the output diphthong in the (HL) foot is short, then there is no measurable way in which the putative head syllable is more prominent in the output than the dependent syllable, for both of them are short and unstressed. Therefore, although Slovak diphthongs are phonetically short, it is essential for Mellander's analysis that diphthongs be represented as long both in the input and in the output

Bethin (1998) also sees the Rhythmic Law as a metrical phenomenon. In her analysis, the Rhythmic Law is a mora-based metrical process where the shortening of the second syllable leads to the construction of uneven trochees:

Figure 5-2: The Rhythmic Law as a metrical rule, reproduced from Bethin (1998, p. 151)



As a result of the shortening of the second long nucleus, the first syllable can be parsed as the head of an uneven trochee. While this account directly captures the similarity of the Rhythmic Law to metrical phenomena, the question remains why Slovak should go to such lengths to construct uneven trochees, in the first place. As we have remarked while discussing the analysis presented in Mellander (2003), the stress pattern of Standard Slovak is described as based on regular syllabic trochees – with the main stress on the first syllable and secondary stresses on every odd syllable irrespective of its weight. The coexistence of syllabic and uneven moraic trochees within one system can only be expressed in terms of levels (see Rubach, 1997 and Kiparsky, 2010b for models of OT allowing levels). Another problem with the metrical solutions based on uneven trochee is their incompatibility with the Iambic/Trochaic Law (Hayes, 1995):

(4) Iambic/Trochaic Law

a) Elements contrasting in intensity naturally form groupings with initial prominence.
b) Elements contrasting in duration naturally form groupings with final prominence.

Bethin (1998) recognizes this problem and notes, 'If quantity were the basis for metrical rhythm in Slovak, then one might expect the first of the two syllables to shorten, thereby producing an iambic (quantity-based) rhythm' (*op. cit*., p. 151). Thus, the Rhythmic Law cannot be based on quantity – but apparently, it is. The paradox is solved by positing that 'the Rhythmic Law is not quantity-based as much as it is intensity-based, though the intensity is realized by syllable length' (*ibid*.). From this point of view, the Rhythmic Law owes its nature to the 'restriction on adjacent prominence and the simultaneous tolerance of an alternating pattern of prominent (long) and less prominent (short) syllables' (*op. cit*., p. 152). Although we share Bethin's view on the role of prominence in Slovak quantity alternations, her proposal that the Rhythmic Law is intensity-based and that the intensity is realized by syllable length does not seem to be as clear as one would wish. Does it mean that the input length of long monophthongs is interpreted as intensity for the purposes of the Rhythmic Law and next is realized as length, notwithstanding?

5.1.3 Length alternations unrelated to the Rhythmic Law

A strictly metrical account of the Rhythmic Law is further undermined by a whole range of morpheme-dependent length redistribution processes in Standard Slovak. Firstly, not all cases of shortening can be attributed to the Rhythmic Law. Secondly, Standard Slovak exhibits cases of regular, if morphologically conditioned, lengthening. When genitive plural forms of mostly feminine and neuter nouns contain no overt ending, the nucleus of the rightmost syllable is lengthened. As evidence by the example *fakulta* in the table below, borrowings can also be subject to this process, although there are several exceptions (e.g. *geto* 'ghetto' Nom. Sg – *get* Gen. Pl.; *kimono* 'kimono' Nom. Sg – *kimon* Gen. Pl.). The examples of lengthening presented below are taken from Kenstowicz & Rubach (1987), Rubach (1993), and Dvonč (1998).

Table 5-5: Final lengthening in the genitive plural of neuter and feminine nouns

NOM.SG	kopyt-o	srdc-e	lon-o	lip-a	lopat-a	fakult-a
GEN.PL.	kopýt	sŕdc	lôn[13]	líp	lopát	fakúlt
Gloss	hoof	heart	lap	linden	shovel	faculty

but *nížina* 'lowland' – *nížin,* not * *nížín*

If there is a general preference for uneven syllabic trochees, as stipulated in Mellander (2003), then it is not easy to explain why it is the second and not the first vowel in e.g. *lopát* that is lengthened, as both nuclei are underlyingly short. Let us assume that there is some hypothetical constraint GENPL-FINALPROM which requires that the *last* syllable of a genitive plural form should be heavy, that is to say, should contain a long nucleus. In order for the lengthening in e.g. *lopát* to take place, this constraint must outrank the faithfulness constraint DEP-μ, which militates against the insertion of moras. The fact that underlying LL sequences are not normally parsed as (HL) means that DEP-μ in its turn must outrank the HD-PROM constraint, which favours the (HL) parsing. The ranking GENPL-FINALPROM >> DEP-μ >> HD-PROM ensures that *lopát* wins over **lópat*, despite the fact that the second form is favoured by the uneven trochaic footing proposed by Mellander. The same ranking, however, means that forms like *nížin*, in which the potential site of lengthening is preceded by a long nucleus, should be parsed as **nížín*, with long nuclei in both syllables – which is not the case.

Rubach (1993) formulates a rule of vowel lengthening before yers.[14] The derivation of *nížin* involves an 'idle running' of this rule. The last syllable of the word is lengthened before a mute yer vowel (case ending) only to be subsequently shortened under the Rhythmic Law. McCarthy (2003) argues that derivations of this kind, known as Duke-of-York derivations, are universally absent from phonology. The opposite view is expressed by Rubach (2003), who shows that Duke-of-York derivations are present in Polish and proposes that they can be handled by a model of Optimality Theory which allows levels. If levels are not allowed, then the output of *nížin* can be reconciled with Mellander's metrical analysis by positing that the forming of feminine and neuter

[13] The letter ô denotes the diphthong [u͡o].

[14] Some yer-containing suffixes do not trigger length alternations. Rubach (1993) reports that one yer-containing suffix triggers regressive shortening.

genitive plurals involves allomorphy. However, the regularity of the genitive plural lengthening, its predictability and applicability to loanwords all make a solution based on allomorphy not very attractive.

Another regular pattern of lengthening involves the diminutive suffix *-ok*, which lengthens the neighbouring syllable of the stem:

Table 5-6: Lengthening before the diminutive suffix *-ok*

Gloss	castle	leaf	flower
BASE NOUN	hrad	list	kvet
DIMINUTIVE	hrád-ok	líst-ok	kviet-ok

It is worth noting that, from the point of view of a metrical analysis based on uneven trochees, this particular case of lengthening can be analyzed as creating an uneven trochaic (HL) foot. However, Mellander's metrical analysis is inapplicable here because of the high ranking DEP-μ constraint, which is used to block LL sequences from being parsed as (HL) through the lengthening of the first short syllable.

The surface zero-ending in the genitive plural forms in Table 5-5 is often analyzed as containing a non-vocalized yer, while the diminutive suffix *-ok* from Table 5-6 contains a vocalized back yer. When followed by a full vowel, as in e.g. Nom. Pl. forms, the yer alternates with zero (is mute): *list-k-y, kviet-k-y*. The lengthening before this and other yer-containing suffixes, including the non-surfacing yer at the end of genitive plural forms, can be accounted for by means of Rubach's rule of vowel lengthening before yers. It should be kept in mind, however, that some yer-containing suffixes do not trigger lengthening.

Ďurovič (2006) proposes that the long nuclei in such diminutive forms as *fliač-ik, vláč-ik, krôč-ik* also result from lengthening. The nominative singular forms of the base nouns *fl'ak* 'spot,' *vlak* 'train,' *krok* 'step' have short nuclei. Correspondingly, Ďurovič posits that the long nuclei in the diminutives result from a lengthening caused by the diminutive suffix *-ik*. According to him, this suffix is not a shortened version of the abovementioned diminutive suffix *-ík*, but a separate suffix with distinct combinative properties: unlike its underlyingly long counterpart, it presumably does not allow for double diminution, cf. *háj* 'grove' – *háj-ik* – *háj-ič-ek* , but not *vlak* 'train' – *vláčik* –

**vláčiček*. Rubach (1993) analyses forms like *vláč-ik* as resulting from a special rule of vowel lengthening before the suffix *-ík* (ík-Lengthening). In his analysis, this suffix lengthens the preceding nucleus and then gets shortened by the Rhythmic Law: *vlak-ík* → *vláč-ík* → *vláč-ik*. When following an underlying long nucleus, the suffix is also shortened by the Rhythmic Law: *džbán+ík* → *džbánik* from *džbán* 'jar'. In effect, the underlying long nucleus of the suffix surfaces only when the preceding short vowel exceptionally does not get lengthened by ík-Lengthening.

If Rubach's analysis is accepted, then forms resulting from the rule of ík-Lengthening may prove problematic for the metrical account developed in Mellander (2003). True, the outputs of these forms are compatible with the Rhythmic Law: a long vowel is followed by a shortened vowel. However, the mechanism of the Rhythmic Law, as analyzed by Mellander, is that underlying HH sequences are parsed as (HL). In this case, however, an underlyingly LH sequence is parsed as (HL), incurring a double violation of WEIGHT-IDENTITY-IO. This 'length metathesis' also involves a violation of MAX-μ on the suffix vowel and a violation of DEP-μ on the root vowel. While violations of MAX-μ are allowed under Mellander's analysis in order to achieve the preferred (HL) parsing, violations of DEP-μ are problematic, as they would allow (LL) sequences to be parsed as (HL), which does not happen. In order to remedy the metrical analysis, one would have to resort to morpheme-specific solutions.

Czech, a closely related West Slavic language, has a similar vowel lengthening process in diminutive nouns: *vlak* 'train' but *vláč-ek* dim., *knih-a* 'book' but *kníž-k-a* dim. Scheer (2003) proposes an analysis based on moraic templates: Czech diminutives must have at least three moras. Applied to Slovak, this analysis correctly predicts the presence of a long nucleus in diminutives: *les-ík, hrád-ok, fliač-ik.* However, the problem of the *-ik*/*-ík* suffix remains unsolved. True, the templatic approach predicts that both *fliač-ik* and *les-ík* receive a third mora, but it does not predict whether this mora is realized on the root or on the suffix (both base nouns have a short vowel in the root: *fl'ak*, *les*).

Another instance of vowel lengthening can be observed in some masculine nouns. In these nouns, the root vowel is long before the zero-ending in the nominative and accusative singular. In all the declension cases with overt endings, the root vowel is short:

Table 5-7: Length alternation in some masculine nouns

Gloss	frost	bread	table	knife
NOM./ACC. SG	mráz	chlieb	stôl	nôž
GEN. SG	mrazu	chleba	stola	noža

Rubach (1993) sees this lengthening process as triggered by an underlying yer, the Nom./Acc. Sg case marker. It should be noted that only some masculine nouns exhibit the alternation presented in Table 5-7. There is no automatic lengthening of the nominative/accusative singular, cf. *dub – duba* 'oak,' nor is there automatic shortening before overt endings, cf. *dráb – drába* 'sherif.' As proposed by Rubach, nouns which are subject to this lengthening rule are listed.

The diminutives formed on the basis of this group of masculine nouns with the suffix *-ík* are often quoted as violating the Rhythmic Law. Compare the base nouns with their diminutive forms: *nôž – nožík, stôl – stolík, chlieb – chlebík, mráz – mrazík/mrázik*. If the nominative singular form is taken as the base for the derivation, then we are dealing with a violation of the Rhythmic Law, which shortens the second long syllable rather than the first one. On the other hand, if the derivation is performed on the basis of the root (without the Nom. Sg lengthening), then the underlying short vowels should undergo the aforementioned rule of -ík-Lengthening proposed by Rubach. However, they remain short. In our subsequent analysis of the diminutive suffix *-ík*, we shall follow Ďurovič (2006) in seeing it as separate from the short suffix *-ik*, which lengthens the preceding nucleus.

5.1.4 The exceptional status of the agentive suffix *-ár*

Before we list regular exceptions to the Rhythmic Law, we would like to pay some extra attention to the agentive suffix *-ár*. Ever since the Slovak spelling reform of 1991, this particular suffix has been subject of active and sometimes quite fierce debate. One of the novelties introduced by the new norms was the decision to extend the application of the Rhythmic Law to some suffixes that had been previously treated as exceptions, including the suffix *-ár*. Thus, while the old norm was for this suffix always to remain long, the new norm requires that it undergoes shortening after a long nucleus, cf. *bájka* 'fable' – *bájkár* 'fabler' (old norm) versus *bájkar* (new norm). In many cases, different versions

of new dictionaries and spelling compendiums recommend different versions of words formed with the suffix *-ár*. The reasons for this state of affairs can be inferred from the long discussion concerning the new norms and other related issues between Dvonč (1998, 1999, 2000) and Kačala (1998, 1999). While both authors agree that *-iar*, the positional variant of the suffix *-ár* occurring after palatalized consonants, should ***not*** undergo shortening under the Rhythmic Law, they disagree as to whether or not the Law should apply to the suffix *-ár* when the preceding syllable contains a diphthong. According to Dvonč (1998), there is a tendency for long monophthongs not to shorten when following a diphthong; correspondingly, in his view, the suffix *-ár* should not undergo rhythmic shortening when following a diphthong.[15] Kačala (1999) opts for a more extensive application of the Rhythmic Law, also after diphthongs. Ďurovič (2006) takes a radically different stand; he argues that the suffix *-ár* is not subject to quantitative neutralization at all and quotes surveys taken by him in a number of Slovak cities in support of his statement that this suffix 'cannot exist in the shortened form *-ar* for systemic reasons.'[16] Sokolová & Jarošová (2008) also enumerate this suffix as one of the suffixes which are 'resistant to shortening,' although they do not refute the new norms *expressis verbis*. Given the significant differentiation of views on the topic, we base our subsequent discussion on the norms dating from before the year 1991.

The properties of the suffix *-ár* with respect to length alternations are as follows:

a) The suffix does not undergo shortening under the Rhythmic Law: *bábkár* 'puppeteer,' *mliekár* 'dairyman,' *gýčiar* 'kitsch artist'[17], and so on.
b) The suffix often shortens the immediately preceding syllable, as shown in Table 10 below.

Table 5-8: Shortening of root vowels before the agentive suffix -ár.

BASE	**Gloss**	**AGENT NOUN**	**Gloss**
pís-at'	to write	pis-ár	scribe
hviezd-a	star, n	hvezd-ár	astronomer

[15] If this tendency does exist, it may be due to the fact that Slovak diphthongs are phonetically short.

[16] Translation from Slovak here and elsewhere is ours.

[17] In this last case the suffix surfaces with the diphthong [ia͡]

BASE	**Gloss**	**AGENT NOUN**	**Gloss**
stôl	table	stol-ár	carpenter
koš-ík	basket	koš-ik-ár	basket maker
biblioték-a	library	bibliotek-ár	librarian

Referring to the suffix *-ár*, Ďurovič (2006, p. 233) writes: 'Until recently, this suffix triggered length alternation (shortening) of the last long vowel in the stem, irrespective of its quality.' He adds that currently the shortening triggered by this suffix seems to be limited to front vowels. According to him, the alternation is not present in 'newer words' like *bájkár* 'fabler' and *sviečkár* 'candle maker.' Rubach (1993) proposes a synchronic morphologically-conditioned rule of ár-Shortening, which shortens long nuclei before this suffix. Long vowels are also regularly shortened before the nominalizing suffix *-ák*, as in *múdr-y* 'wise' → *mudr-ák* 'wiseacre.' Although Rubach does not formulate the respective ák-Shortening rule, it is clear that, within the framework adopted in his work, such a rule can and should be posited. The weakness of an analysis based on morpheme-specific rules is that it misses the fact that both suffixes have a long vowel underlyingly, they both trigger the shortening of the preceding nucleus, and they both are resistant to shortening under the Rhythmic Law.

In an article dedicated to length alternations before the suffix *-ár/-iar* and its combinations with other suffixes (e.g. *-áreň*), Sokolová & Jarošová (2008) discuss the conditions under which the suffix *-ár* and its positional variant *-iar* cause the shortening of the preceding nucleus. They state that this alternation is usually limited to monophthongs as opposed to diphthongs, cf. *víno* 'wine' – *vinár* 'vintner' but *mlieko* 'milk' – *mliekár* 'dairyman.' When diphthongs do get shortened (as in *stôl* – *stolár*) in the table above, they usually show the same behaviour in declension: *stôl/stola – stolár, nôž/noža* 'knife' – *nožiar* 'cutler.' Shortening is blocked when the suffix is separated from the potential site of length alternation by another suffix, cf. *žŕd-k-ár* 'pole-vaulter' from *žŕd-k-a* dim. ← *žrď* 'pole.' When the suffix *-ár* follows the suffixes *-ík* and *-ník*, which regularly undergo rhythmic shortening, the vowel of these suffixes is shortened: *košikár* 'basket maker' ← *košík* dim. ← *koš* 'basket,' *dennikár* 'diarist' ← *denník* 'diary' ← *den* 'day.' Shortening of monophthongs is also common in deverbative derivation: *čit-ár-ň-a* 'reading room' ← *čít-at'* 'to read.' Somewhat surprisingly, shortening before *-ár* is

regular in loanwords that end in -ón, -én, -ína, -óna, -íva, -óza, -éza, -téka[18]: *betonár* 'concrete worker' ← *betón* 'concrete,' *terenár* 'off-road racer' ← *terén* 'terrain,' *doktrinár* 'doctrinaire' ← *doktrína* 'doctrine,' *diskotekár* 'disk-jockey' ← *diskotéka* 'disco-'discotheque,' and so on. Sokolová & Jarošová (2008) supplement this list with loanwords ending in -úra, -ún, -út: *armaturár* 'fitter' ← *armatúra* 'fittings,' *harpunár* 'harpooner' ← *harpún* 'harpoon,' *štatutár* 'statutory representative' ← *štatút* 'statute,' etc.

In accordance with the new language norms introduced in 1991, the suffix *-ár* became subject to shortening under the Rhythmic Law when following a long monophthong. The third edition of *Pravidlá slovenského pravopisu* (2000) expands this norm and states that the suffix *-ár* (but not its positional variant *-iar*) should be shortened after all long nuclei, *viz*. long monophthongs and liquids, and diphthongs, *cf.*: *bábkar* 'puppeteer' (before 1991: *bábkár*), *mliekar* 'dairyman' (until recently: *mliekár*) but *sietiar* 'netter.' As we have already remarked, the decision to extend the application of the Rhythmic Law to the suffix *-ár* and some other suffixes (e.g. the abovementioned suffix *-ák*) has caused an active discussion among Slovak linguists (Dvonč, 1997, 1998, 1999, 2000; Kačala, 1995, 1998, 1999; Kralčak, 2007; Považaj, 1997; Sokolová, 1992). More than fifteen years after the introduction of the new norms, the discussion is still going on. Thus, Sokolová & Jarošová (2008, pp. 197-198) point out that 'resistance to shortening should also apply to the suffixes -ár, -áreň, which occur after hard consonants and are in complementary distribution with the suffixes -iar, -iareň.'

5.1.5 Exceptions from the Rhythmic Law

Even after the introduction of the new norm of Standard Slovak, the list of affixes that fail to undergo shortening under the Rhythmic Law is quite extensive:

1) Neuter collective nouns ending in -ie, e.g. *lístie* 'foliage' Nom. Sg – *lístia* Gen. Sg. – *lístiu* Dat. Sg, *skálie* 'rock' – *skália*, *prútie* 'twigs' – *prútia*, *siatie* 'sowing'– siatia
2) Gen. Pl. ending *-í* of feminine nouns, e.g. *hrádzí* 'dams' Gen. Pl., *básní* 'poems,' *piesní* 'songs,' *sienί* 'halls,' *strojární* 'machine-works,' *tlačiarní* 'printers'

[18] The list and relevant examples are taken from *Pravidlá slovenského pravopisu* (2000).

3) Gen. Pl. forms of feminine and neuter nouns with vowel-zero alternations before the zero ending: *výhra* 'win' Nom. Sg – *výhier*/*výher* Gen. Pl., *hospodárstvo* 'farm' Nom. Sg – *hospodárstiev* Gen. Pl.
4) Possessive adjectives: *páví* 'peackock's' masc. Nom. Sg – *pávie* neut. Nom. Sg – *páviemu* Dat. Sg, etc., *netopierí* 'bat's,' *krokodílí* 'crocodile's,' *diviačí* 'animal's'
5) Present tense of verbs of the *rozumiet'* 'to understand' type, e.g.: *zmúdriet'* 'to get wiser' inf. – *zmúdriem* 1st p. Sg – *zmúdrie* 3rd p. Sg, etc.; *zvážniet'* 'to become serious' inf. – *zvážnieš* 2nd p. Sg, etc.; *vytriezvieť* 'to sober up' inf. – *vytriezviem* 1st Sg, etc.
6) The *-ia* ending of 3rd person Pl. present tense verbs and the *-iaci* ending of related present-tense active-voice participles: e.g.: *chvália* 'praise' 3rd p. Pl., *chváliac* adverbial participle, *chváliaci* active present participle, masc. Nom. Sg; *ľúbia* 'love,' *ľúbiac*, *ľúbiaci*; *vŕšia* 'pile,' *vŕšiac, vŕšiaci*
7) The *-ší, -šia, -šie* endings of the past-tense active participles when following the diphthong *ia*, e.g.: *vyliat'* 'to pour out' inf. – *vyliavší* past active participle, masc. Nom. Sg – *vyliavšia* fem. Nom. Sg
8) Iterative verb suffix *-ieva*: *blúdievať* 'to roam' inf. iterative – *blúdievam* 1st p. Sg – *blúdievaš* 2nd p. Sg – *blúdieva* 3rd p. Sg, *kŕmievať* 'to feed,' *trápievať* 'to afflict'
9) Compounds: *tisícnásobný* 'thousandfold' adj. masc. Nom. Sg, *tretíkrát* 'third time,' *viacmiestny* 'multi-seat' adj. masc. Nom. Sg
10) Indefinite pronouns with *nie-*: s niekým 'with somebody,' niečí 'somebody's' masc. Nom. Sg, niečiemu 'somebody's' masc./neut. Dat. Sg
11) Words with the prefixes *ná-, zá-, sú-*, e.g.: *nádievka* 'dressing' n, *zásielka* 'consignment,' *súčiastka* 'component.'

As Dvonč (1998, p. 293) ironically remarks, 'If the number of cases in which a certain law applies is smaller than the number of cases in which it does not apply, it is hardly a law.' The remark is made with reference to the new spelling rules, which, as a matter of fact, contain less exceptions to the Rhythmic Law than at the time when Dvonč published his comprehensive review of the Rhythmic Law in Slovak (Dvonč, 1955). Although, as indicated in Kačala (1999), there is a certain degree of exaggeration in Dvonč's sceptical remark concerning the status of the Rhythmic Law, currently there seems to be a consensus among Slovak linguists as to the significance of the morphological factor in Slovak length alternations. While older views of the synchronic status of

the Rhythmic Law emphasized 'ease of pronunciation,'[19] treating length alternations as, by and large, phonetically motivated, recent literature puts more emphasis on the properties of individual morphemes. Kačala (2003) explicitly states that the Rhythmic Law is primarily active with respect to inflective suffixes (declination and conjugation endings). An even stronger view is held by Ďurovič (2006), in whose analysis the automatic application of the Rhythmic Law is limited to inflections. It seems, however, that this generalization is too strong: recall that the Rhythmic Law applies without exceptions to the derivational suffixes *-ík* and *-ník*, while some long inflectional endings, e.g. the genitive plural nominal ending *-í* or the 3rd person plural verbal ending *-ia*, escape rhythmic shortening.

Researchers have pointed out that some of the exceptions from the Rhythmic Law are not 'genuine' exceptions. Rubach (1993) argues that possessive adjectives (e.g. *pávi* masc., *pávia* fem.) are derived with the suffix *-i*: //páv+i+í//, //páv+i+á//. The surface *-í* and *-ia* respectively result from vowel contraction. The rule of contraction is ordered after the Rhythmic Law, which explains why the words surface with two long nuclei. Similar mechanisms are used to explain the exceptional behaviour of neuter collective nouns like *lístie* and some other surface exceptions to the Rhythmic Law. Compounds, including indefinite pronouns, can also be excluded from the list of exceptions, if it is assumed that the Rhythmic Law 'does not apply across constituents of a compound' (Rubach, 1993, p. 175). On similar grounds, Kačala (2003) excludes compounds, indefinite pronouns and prefixed words with a long nucleus in the prefix from the list of genuine exceptions to the Rhythmic Law. The exceptional status of compounds in Slovak is reminiscent of the status of stress in Russian compounds. Although there is no regular secondary stress in Russian, dependent constituents of compounds are often allowed to retain a separate, secondary stress. Similarly, compound constituents in Slovak are allowed to retain the original length in violation of the Rhythmic Law.

All in all, Slovak length alternations strike one as highly dependent on the properties of particular morphemes. This fact undermines the validity of the existing metrical accounts. The rule-based account of various shortening and lengthening processes developed by Rubach (1993) offers a more comprehensive picture of length alternations and their interaction with other phonological phenomena. What is not quite satisfactory

[19] For example, Dvonč (1955) states that two long monophthongs one after another are difficult to pronounce.

in his analysis is that it fails to capture the fact that both the progressive Rhythmic Law and the regressive shortening before the suffixes *-ár* and *-ák* seem to be part of a 'conspiracy' to avoid sequences of two neighbouring long nuclei.

5.2 The accent-like nature of Slovak length

Let us try to look at the Rhythmic Law and other types of length alternations in Slovak from an unexpected angle. Apart from metrical shortening, are there any other phonological processes that can result in a 'rhythmic' alternation between phonological properties? In order to answer this question, we have to abstract away from the fact that we are dealing with length and look for analogies supplied by another suprasegmental – tone. One of the most well-known tonal phenomena in Bantu is Meeussen's Rule. Under this rule, in a sequence of two high tones the second tone is deleted. This rule is a special case of the Obligatory Contour Principle (OCP), which prohibits adjacent identical elements. Previous analyses have focused on the similarity between the Slovak Rhythmic Law and the shortening of metrically weak syllables commonly observed in iambic systems. This is only natural, considering the current representation of length by means of timing units (x-slots, moras) rather than an SPE-type feature [±long]. The metrical prejudice, however, masks the fact that the Rhythmic Law (as well as some other regular cases of length alternation in Slovak) is reminiscent not only of metrical alternations but also of the OCP effects.

One of the striking properties of Slovak length is that no morpheme contains more than one long nucleus, either underlyingly or in the output. As far as native morphemes are concerned, this limitation can be ascribed to the way in which modern length developed in the course of history and, in particular, to its connection with the development of word prominence. Another possible factor is a synchronic application of the Rhythmic Law. As native morphemes hardly ever exceed two syllables, length on the first syllable would result in the shortness of the second syllable, irrespective of whether the second vowel is short or long in the input, while length on the second syllable would mean that the first syllable is underlyingly short. However, trisyllabic roots in recent borrowings could potentially have underlying length in the first syllable and in the third one, e.g. as a reflection of the original length distribution in the source language. As far as we could ascertain, even most recent and unfamiliar borrowings do not have morphemes with more than one long nucleus, no matter how long any given morpheme may be. This

situation reminds one of Bantu tone systems or of East Slavic stress. In many Bantu languages, any given morpheme can have either one underlying high tone or none. In the traditional analyses of East Slavic stress, a morpheme is either unaccented or has one underlying accent. This 'pro-culminativity' of Slovak length is somewhat unsettling from the synchronic point of view. If length in this language is 'real', *bona-fide* length, then there should not be any reason not to borrow e.g. trisyllabic morphemes with two long nuclei separated, in satisfaction of the Rhythmic Law, by a short one, if this is what is present in the source language. An interesting link between Slovak length and word prominence can be made on the basis of the analysis of vowel quantity in Latinate borrowings conducted by Jánošík (1938a, 1938b, 1939). He argues that long vowels in loanwords correspond to the original stressed open syllables of Vulgar Latin: *administrácia* 'administration,' *administratívny* 'administrative,' *kolónia* 'colony,' *koloniálny* 'colonial,' *krokodíl* 'crocodile' **but** *redakcia* 'editing,' *miništrant* 'acolyte,' *bacil* 'bacillus.' The limitation to originally open syllables could indicate that the crucial factor was the duration of these syllables, for vowels in open syllables are often longer than vowels in closed syllables. On the other hand, Vulgar Latin did not have distinctive length, so an increase in duration was simply a correlate of stress. In effect, Slovak vowel length in Latinate loanwords reflects the original stress.

Thanks to the Rhythmic Law, Slovak length is often culminative on the word level, which is most evident in the case of non-derived nouns and adjectives. In these groups, roots are mostly monosyllabic. Correspondingly, length can appear either on the root or on the desinence. One cannot fail to notice a certain similarity between the distribution of length in Slovak noun declension and the accentuation of East Slavic nouns. Compare the Slovak *mesto, mesta, mestá, mestách* with the respective forms in Russian: *'mesto, 'mesta, me'sta, me'stax*. Just like the Slovak plural endings realize their underlying length on the surface, the Russian plural endings realize their underlying 'accent' and receive stress. Slovak monosyllabic nouns with a long nucleus in the root like *víno* remind Russian nouns with a fixed stress on the root; in the Slovak case, roots realize their underlying length on the surface throughout the paradigm, in the Russian case, roots realize their underlying 'accent' throughout the paradigm. In terms of morphological structure, the following interesting observation can be made: both syllables that can be potentially involved in the Rhythmic Law (that is, the first syllable of the inflectional desinence and the last syllable of the root/stem) are located at the boundary between the root/stem and the inflection. As a result, in all the plural case forms whose endings are underlyingly long, the boundary between the root/stem and inflection is always marked

by length on either side of the boundary. Also in Gen. Pl. forms with no overt ending, the last syllable of the root surfaces as long, *cf.* Nom. Pl. *mest-á*, *lopat-y* and Gen. Pl. *miest*, *lopát*. In this way, length in the plural paradigm of neuter and feminine nouns is not only culminative but also obligatory, in a manner of speaking.

The analogy between Slovak length and East Slavic stress becomes even more striking if one takes into account the principal role of vowel duration in the signalling of Russian and Belarusian stress. According to various sources (Avanesov, 1974; Bondarko, 1977, 1998; Zlatoustova, 1956), duration is the best or indeed the only reliable stress cue in Russian. The duration ratio between long and short vowels in Slovak is comparable to the duration ratio between Belarusian stressed vowels and their unstressed counterparts in word-internal syllables, except for the immediately pretonic ones. According to Beňuš and Mády (2010), long vowels in Slovak are 1.5-2 times longer than their short counterparts. In Belarusian, high stressed vowels are 1.4-2 times longer than their unstressed counterparts, while for the vowel [a] this ratio is even higher (Andrèeŭ, 1984).

5.3 A feature-based analysis of Slovak length alternations

In view of the one-per-morpheme distribution of Slovak length and the atypical nature of the Rhythmic Law (if seen as a metrical phenomenon), we propose that a considerable part of instances of long nuclei in Slovak can be analyzed as encoded with an autosegmental feature rather than timing units. Under this analysis, the Rhythmic Law emerges as an OCP effect comparable to Meeussen's Rule in Bantu. Perhaps the most striking Bantu parallel to the Slovak Rhythmic Law is the alternating distribution of high tones in the sequence stretching from the first object prefix to the first mora of the verb root in Rundi. If a high tone is present in this sequence, it appears on the first object prefix and then, in a strictly alternating manner, on every other mora (Hyman, 2001). Just like the Rhythmic Law, the alternating patterning of high tones in Rundi has been analyzed in metrical terms (Goldsmith & Sabimana, 1989). The alternative analysis in Hyman (2001) is based on the OCP.

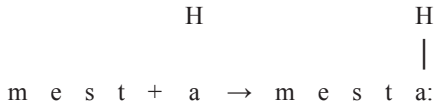
In our opinion, the choice between a metrical and an OCP-based analysis of the Rhythmic Law in Slovak is not just a matter of taste. The putative preference for uneven syllabic trochees in Mellander's analysis or uneven moraic trochees in Bethin's analysis, while expressible in OT, remains an atypical metrical phenomenon. This atypical nature

of the shortening is recognized by Bethin (1998), who remarks that the Rhythmic Law is based not so much on quantity as on intensity, and that intensity is realized as syllable length – a logical supposition in view of Hayes' Iambic/Trochaic Law. If we take this insight a little further and analyze Slovak length as an expression of underlying prominence encoded in the input by an autosegment, we can directly capture the accent-like properties of Slovak length and resolve the theoretical difficulties presented by the metrical analyses of the Rhythmic Law.

Now, what would the properties of this putative prominence feature be? First of all, only one instance of this feature can be sponsored by a single morpheme. In the input, this feature may be either pre-linked or floating. The feature is subject to the OCP in the output: neighbouring nuclei cannot bear the feature. Nuclear length may be an expression of the autosegmental prominence feature or occur independently in those nuclei that neither undergo nor trigger length alternations (are not subject to the OCP).

If none of the constituent morphemes has the prominence feature H in the input, the feature will not be inserted, and the word will surface without long nuclei corresponding to underlying prominence. The Nom. Sg and Gen. Sg forms of *mesto* illustrate this possibility: mest+o → mesto; mest+a → mesta. The Nom. Pl. form of the same word contains an H in the input of the inflectional ending and, correspondingly, surfaces with output length:

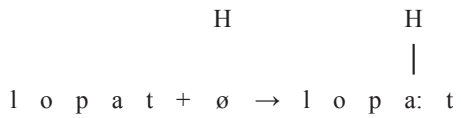
Figure 5-3: Input-output mapping of the nominative plural form of a neuter noun



This form shows that the constraint against the creation of new association lines (*LINK) is ranked lower than MAX(H), the constraint against the deletion of H. Another constraint which is ranked higher than *LINK is the constraint against floating *FLOAT.

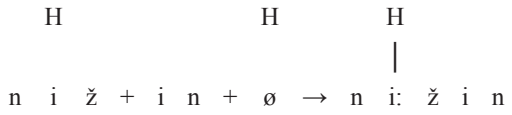
The lengthening of the final syllable of the root in the genitive plural of neuter and feminine nouns is accounted for by positing that the zero ending carries a floating feature H. As the ending does not have any phonetic substance in the output, the feature is docked on the preceding root/stem.

Figure 5-4: Final lengthening in the genitive plural



From the above example it follows that, if a floating feature cannot be realized on the sponsoring morpheme, it is realized on a neighbouring morpheme. In terms of constraints, the constraint MAX(H), which militates against the deletion of this feature, is ranked higher than the constraint requiring that the feature stays on its sponsoring morpheme. One way to ensure that the feature docks on the second rather than the first syllable of the root would be through the alignment constraint ALIGN-R (H, Root), which requires H to be aligned with the right edge of the root. Now, what happens if the first syllable of a disyllabic stem is long like in the feminine noun *nížin*?

Figure 5-5: Processing of a genitive plural input with two instances of H

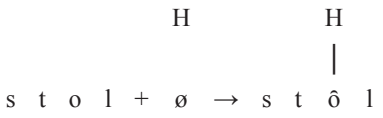


For the time being, we assume that both instances of the feature H are floating. The first H is docked on its sponsoring morpheme, while the instance of H sponsored by the ending does not dock on the root and is stray-erased. The stray-erasure is achieved through the undominated constraint against floating features in the output *FLOAT. Due to the OCP constraint, which bars neighbouring instances of H, only one instance of H becomes docked and is realized in the output. The fact that the OCP constraint is satisfied despite the need to delete one instance of H supplied by the input means that the constraint against deletion MAX(H) is ranked lower than OCP. The choice between the actual output *nížin* and the hypothetical variant **nižín*, in which the first H is deleted and the second one is realized on the last syllable of the root, is made by the constraint forcing the realization of features on the source morpheme.

Following Rubach (1993), we interpret the length alternation between the nominative singular form of some masculine nouns and the remaining declension forms as resulting from vowel lengthening in the nominative singular: *stola* 'table' Gen. Sg but stôl Nom. Sg. The lengthening of the root vowel in the nominative singular forms can

be accounted for, if the respective case ending is represented as composed of a yer and containing a floating instance of H:

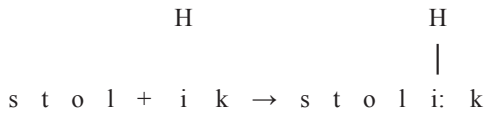
Figure 5-6: Lengthening in Nom. Sg of masculine nouns



As we have mentioned earlier, lengthening in the nominative singular applies to some masculine nouns but not to others. Correspondingly, Rubach proposes that nouns whose root vowels are subject to lengthening in this position are listed. Under our analysis, such nouns would have to be listed as blocking the realization of H on the root. Alternatively, the singular case ending could be analyzed as having two allomorphs: one with an H, and the other without it. We prefer the second option, because now nouns are no longer listed as allowing or blocking a phonological process. Instead, they are listed as taking one or the other allomorph of the nominative singular case ending, so the irregularity is confined to morphology.

Under the assumption that the root vowels of the nouns that undergo lengthening in the nominative singular are short in the input, diminutives derived from such nouns with the suffix *-ík*[20] do not have to be considered exceptional: *stôl* but *stol-ík*, *chlieb* but *chleb-ík*, *nôž* but *nož-ík*.

Figure 5-7: Processing of diminutives based on short roots



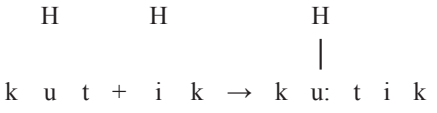
[20] We follow Ďurovič (2006) in assuming that the underlyingly long suffix *-ík* is separate from the underlyingly short suffix *-ik*. Recall that the former suffix realizes its length when following a short nucleus and gets shortened after a long nucleus. The latter suffix always remains short but lengthens the preceding short nucleus. Rubach (1993) suggests that this is one and the same suffix *-ík*. Under this analysis, whether or not the suffix causes the lengthening of the preceding short nucleus is the property of the respective root: exceptional roots do not get lengthened. What both analyses have in common is that the realization of underlying length is blocked after a long nucleus.

Sokolová & Jarošová (2008) quote the derived nouns *stol-ár* and *nož-iar* as examples of vowel shortening before the suffix *-ár*. Of course, if the root nucleus is underlyingly short, then we are not dealing with shortening but with faithfulness to input.

Let us dwell some more on the peculiar properties of the suffix *-ár*. As mentioned earlier, many descriptions of Slovak single out this suffix as resistant to shortening under the Rhythmic Law. Moreover, the suffix often shortens the immediately preceding long nucleus. From an accentual perspective, this exceptional behaviour bears a resemblance to the behaviour of dominant suffixes in East Slavic. When a dominant suffix is present in a derived word, the underlying accentual specifications of the remaining morphemes cease to play a role in stress assignment. Stress is assigned either to the dominant suffix itself throughout the declension paradigm or to the inflection, again throughout the paradigm (whenever an inflection is present). Slovak length does not have to be culminative on the word level, so the presence of the suffix *-ár* does not automatically lead to the shortening of all the remaining nuclei of the word. However, just as a dominant suffix in Russian always realizes it underlying prominence, the suffix *-ár* realizes its underlying length irrespective of its environment. By contrast, the behaviour of the inflectional suffixes and derivational suffixes like the agentive suffix *-ník* is comparable to the behaviour of recessive suffixes in Russian. Even when a recessive suffix is underlyingly accented, its ability to attract stress depends on the accentual properties of other morphemes. In a similar fashion, certain suffixes in Slovak can only realize their length, if the last nucleus of the base to which they are added is short.

One way to express the difference in the properties of the suffixes *-ár* and *-ík* is to posit that they differ with respect to the input representation of the prominence feature H. Namely, in the suffix *-ár*, the feature is pre-linked. The stability of its realization is due to a constraint banning the delinking of autosegments (*DELINK). In the input of the suffix *-ík*, the feature is floating, and its output realization is conditioned by the properties of neighbouring morphemes. In particular, the feature does not get linked and is stray-erased, if its realization in the output would violate the OCP:

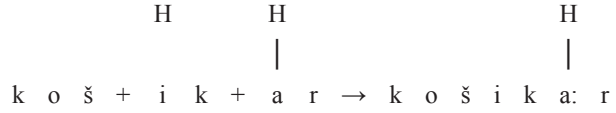
Figure 5-8: OCP precludes the realization of one of the two instances of H



If both instances of H are floating, then the choice between them could be made through alignment requirements. Two alignment constraints may be at play here: ALIGN-R/ROOT (H, R, Root, R) and ALIGN-R/STEM (H, R, Stem, R). The first constraint requires that the right edge of the span of the feature H be aligned with the right edge of the root. The second constraint requires that the right edge of the H span be aligned with the right edge of the stem. If ALIGN-R/Root >> ALIGN-R/Stem, then the first floating H will be chosen over the second floating H in the resolution of OCP.

If one of the instances of H is pre-linked in the input, then the choice between the first and the second instance of H is trivial. The pre-linked instance of H cannot be deleted due to the high ranking of the constraint against the removal of the existing links *DELINK. Due to the OCP, the floating H does not get docked on the suffix. This mechanism accounts for the shortening of the suffix *-ík* before the suffix *-ár*:

Figure 5-9: A floating H cannot be realized if adjacent to a pre-linked H



The affinity between the progressive and regressive shortening in Slovak has not remained unnoticed by linguists (cf. Kačala, 1995). The novelty of our OCP-based analysis consists in the formalization of this affinity. The shortening of the suffix *-ík after* long roots and *before* the suffix *-ár* is seen as driven by the same 'restriction on adjacent prominence,' to quote Bethin (1998) once again.

The distinction between floating and pre-linked autosegments can also be used to analyze the different behaviour of roots with respect to the shortening triggered by the suffix *-ár*: *hviezd-a → hvezd-ár* but *mliek-o → mliek-ár*. The same diphthong /ie/ is shortened in the first case but remains unchanged in the second one. Significantly, both roots trigger the shortening of long inflectional endings; this fact excludes an analysis where the second root *mliek-* does not contain an H in the input and therefore is not subject to shortening under the OCP. By analogy to our analysis of the suffix *-ík*, we propose that the root of *hviezd-a* contains a floating H, which does not get linked before the suffix *-ár* due to the OCP and is eventually stray-erased. One way to explain why the same thing does not happen in *mliek-ár* is to assume that, in this root, the input feature H is pre-linked and further that the constraint against delinking *DELINK is ranked higher

than OCP. Ideally, the status of *DELINK should be verified against words with two 'dominant' suffixes (e.g. *-ár* and *-ák*) next to each other; unfortunately, we have not been able to establish whether such cases exist.

Words like *báb-k-ár* constitute exceptions from the Rhythmic Law not only because the derivational suffix is not shortened. Sokolová & Jarošová (2008) discuss another aspect of this and similar forms, namely: the resistance of their root vowel to shortening before the suffix *-ár*. They point out that the suffix *-ár* is separated from the potential shortening site by another suffix (*-k*) and propose that regressive shortening can only be applied to neighbouring morphemes as opposed to neighbouring syllables. This restriction does not apply to progressive shortening, cf.: *hvezd-ár-sk-y*, where the underlyingly long inflectional ending *-ý* is shortened, although it is separated from the suffix *-ár* by the adjectivizing suffix. In terms of an OCP-based analysis, the failure of the regressive shortening to apply to forms like *báb-k-ár* may be indicative of the need for a reformulation of the respective adjacency requirements.

In this connection, let us examine the following derivation: *sán-k-y* 'sledge' is derived from *san-e* with the diminutive suffix *-Ok*.[21] The suffix triggers the lengthening of the root vowel. In terms of our autosegmental analysis, the diminutive suffix sponsors a floating H, which docks on the root. The form *sán-k-ár*, based on *sán-k-y*, violates the OCP on the surface. In the input of *sán-k-ár*, the two instances of H are sponsored by two neighbouring morphemes: there is a floating H on the diminutive suffix and a prelinked H on the suffix *-ár*. In the output, however, the floating H is not realized on its sponsoring morpheme but on the root. Thanks to the fact that the yer vowel of the diminutive suffix is not vocalized in the output, the first H is still adjacent to the second instance of H in terms of syllables[22] – but in fact it has moved one position to the left from its original sponsor. It seems that adjacency for the needs of the OCP is sensitive to morpheme boundaries within the stem. Note, however, that inflectional endings are shortened irrespective of morpheme boundaries: *sán-k-ach* but *mest-ách*. The persistence of root length in derived words of this kind may also be analyzed as due to output-output faithfulness.

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[21] The capital O stands for a back *yer*.

[22] Unless one allows for empty nuclei: *sá.nø.kár*. Now the failure of the OCP to apply can be explained by syllabic non-adjacency. It must be pointed out, however, that the presence of an empty nucleus does not prevent a long case ending from shortening: *sá.nø.kach* instead of the expected *sá.nø.kách*. As we see, morphological structure must be taken into account even if empty nuclei are allowed.

Although we have been using the term 'long' to describe nuclei with the putative prominence feature H, the actual phonetic realization of this feature does not necessarily involve length. As we have mentioned before, Slovak diphthongs are described as phonetically short. The representational difference between e.g. the long /e:/ and the diphthong /ie/ is that in the first case we are dealing with one root node linked to two moras, while in the latter case two root nodes are linked to one mora. It could be said therefore that the feature H is realized as compulsory binarity of root nodes or moras in long monophthongs and short diphthongs correspondingly. Under the account we have proposed, Slovak length is literally 'an expression of something else' (Bethin, 1998). A complete scheme of the phonetic realization of the hypothetical autosegment H is outside the scope of this preliminary work, as it would require a comprehensive OT analysis of the vocalic system of Slovak.

To sum up, even this preliminary outline of an OCP-based account of length alternations in Slovak is quite promising. Unlike metrical accounts, the account we propose is not incongruous with the Iambic/Trochaic Law and with the existing descriptions of Slovak stress as based on syllabic trochee. In addition, the fact that Slovak diphthongs are phonetically short is not problematic for our analysis, as it is not based on metrical structure. The account directly captures the affinity between the progressive shortening under the Rhythmic Law and the regressive shortening before the long suffixes *-ár* and *-ák*: both types of shortening are seen as OCP effects.[23] In previous work (Rubach 1993), vowel shortening before the suffixes *-ár* and *-ák* had to be accounted for by means of morphologically conditioned rules; hence, the connection between the persistent length of these suffixes and their ability to trigger regressive shortening was missed. Our analysis establishes a connection between the ability of these suffixes to trigger regressive shortening and their resistance to shortening under the Rhythmic Law. Under such an analysis, the special properties of these suffixes do not compromise the systematic nature of the Rhythmic Law. Just as dominant suffixes in Russian constitute an integral part of its accentual system, Slovak suffixes with non-alternating length have their place in the system of length distribution.[24]

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[23] It should be noted here that there are cases of shortening before underlyingly short suffixes. We follow other researchers in seeing cases of this kind as morphologically conditioned.

[24] Interestingly, the Belarussian suffixes *-ak* and *-ar*, cognates of the two Slovak non-alternating suffixes discussed herin, are both dominant.

5.4 Slovak as a double-prominence system?

The prevailing view is that modern Slovak length in general and the Rhythmic Law in particular are linked with the accentual development of Late Common Slavic (Krajčovič, 1975; Pauliny, 1963). Until a certain point, 'there was generally a maximum of one long vowel per word' in Late Common Slavic (Feldstein, 1990). Later, vowel coalescence resulted in the rise of new long nuclei. According to Feldstein (*ibid.*), the Rhythmic Law was a specific Central Slovak response to vowel coalescence. In his view, at the time of vowel coalescence, length in Central Slovak was still a mark of word ictus; correspondingly, the second long nucleus had to be shortened due to the culminative nature of word ictus. As we have remarked above, the culminative nature of length is still very much a property of non-derived Slovak words. However, length and obligatory word ictus are separated in modern Slovak. Stress is word-initial, while length, even when there is only one long nucleus in a given word, may or may not coincide with stress. Despite certain pro-culminative properties of Slovak length, derived word forms may have more than one long nucleus, and even non-derived words have exceptional long endings (e.g. the Gen. Pl. ending *-í*, which is never shortened under the Rhythmic Law). Length, therefore, is no longer culminative on the word level. If Feldstein (1990) is right in seeing culminativity as the original driving force behind the Rhythmic Law, then our account means that culminativity has been reanalyzed as an OCP effect, while metrical accounts mean that culminativity has been reanalyzed as a metrical alternation of strong and weak syllables.

We would like to emphasize that the OCP-based account of Slovak length alternations on the basis of an autosegmental tonal feature is not an attempt to reintroduce the SPE-style [±long] feature. This is especially clear if we consider the fact that the actual phonetic realization of the feature which we labelled H presupposes either the binarity of timing units (in long monophthongs and liquids) or the binarity of root nodes (in diphthongs). Phonological operations driven by the OCP, *viz*. linking and deletion, are not performed directly on moras.

Another potentially problematic issue is how our analysis of Slovak length as an expression of underlyingly encoded prominence tallies with the fact that Slovak has word-initial main stress and iteratively assigned secondary stress. We believe that this concern is no more justified in this case than, for instance, in the case of a Bantu language with syntagmatically contrastive or culminative tone and penultimate stress. In some lan-

guages of this kind, tone is aligned with stress, in others it surfaces independently from stress. In effect, these systems often are 'double prominence' systems, with tone being encoded in the input and stress assigned metrically. Stress in Slovak is metrically determined, obligatory and delimitative in its function, marking the beginning of the word. Durational prominence is not obligatory and reflects the underlying prominence characteristics of morphemes. As a rule, it occurs at morpheme boundaries and is expressed as length or, to be more precise, as the binarity of timing units or root nodes.

5.5 Tone, stress and duration in the development of West Slavic prominence

In diachronic terms, Slovak length has two main sources (Bethin, 1998; Kapović, 2005; Krajčovič, 1975). One is the 'neo-acute' rising pitch, which presumably marked word ictus on the last syllable of some roots at a late stage of Late Common Slavic; the other is vowel coalescence (morpheme contraction). In addition, as suggested by Feldstein (2011) and Scheer (2003), West Slavic length came to be used to mark certain morphological contrasts and categories. One could suppose that, at least in some cases, long nuclei resulting from coalescence were reinterpreted as intrinsically prominent and therefore subjects to the OCP. The nuclei that are now long or diphthongal due to the development of neo-acute rising pitch and vowel coalescence have not lost their underlying prominence. Similarly, underlying prominence has been retained by 'accented' morphemes in Belarusian or Russian. The difference between Slovak and East Slavic prominence is that word stress in Slovak is no longer aligned with any of the intrinsically prominent morphemes, while in East Slavic the location of stress is still dependent on the underlying accentual properties of morphemes.

When presenting an OCP analysis of the Rhythmic Law, we propose that there is a preference for the feature H to be right-aligned with the right edge of the root/stem. In practice, the syllable which is right-aligned with the right edge of the stem/root is often the penultimate syllable, as inflectional endings are mostly monosyllabic. Interestingly, word stress in those Slovak dialects that have lost length is fixed on the penultimate syllable rather than the word-initial one. The dialects with penultimate stress and no length distinction neighbour on dialects of Polish, so in principle the penultimate stress may be explained by the influence of Polish; this is how Baerman (1999) explains the emergence of fixed penultimate stress in some Ukrainian dialects bordering on Polish.

Whether or not this is indeed the case, one should not overlook the fact that Polish is also believed to have had word-initial stress until about the fifteenth century (Stieber, 1968). During the period when Polish stress was word-initial, the language had distinctive vowel length, which at a later point was replaced with differences in vowel quality. The loss of these vowel-quality distinctions corresponding to the earlier quantitative distinctions roughly coincided with the shift from word-initial stress to penultimate. In her study on the historical phonology of Kashubian, a Lechitic language closely related to Polish and usually classified as a dialect of Polish, Topolińska (1974) points out that, in the course of the development of Kashubian dialects, there was an intriguing connection between the location of fixed stress and the existence of quantity distinctions: 'it seems that whenever an initial stabilization[25] was attained, it preceded the loss of quantity […] on the contrary – the penultimate stabilization, in some areas at least, results from the levelling carried out after the loss of quantity.' Before the loss of quantitative distinctions, length predominantly appeared on the penultimate syllable. The fixation of stress on the penultimate was a way to maintain the prominence of the respective syllables by means of the only remaining marker of prominence – word stress.

[25] Fixed word-initial stress – A.D.

6. Free stress in the typology of word prominence

6.1 On the affinity between free stress and tone

In the introduction to the present thesis, we touched upon the typological distinction between free and fixed stress systems. In a fixed-stress system, the locus of stress can be predicted on the basis of a number of metrical parameters (type of foot, alignment with either the right or the left word edge, etc.). In free-stress systems, stress is placed in a surface-unpredictable manner. Such systems may show little evidence of foot structure. Standard Russian, for example, reportedly lacks secondary stress in non-compounds. Metrical accounts of Russian stress have variously classified the Russian footing as iambic, trochaic, bounded, unbounded, iterative, and non-iterative – which pretty much exhausts the foot inventory. What does a system like this have in common with a typical stress system like Polish or Dutch?

In his article on the typology of stress and tone, Hyman (2006, p. 231) proposes the following criteria of stress languages as opposed to non-stress languages:

(1) A language with stress accent is one in which there is an indication of word-level metrical structure meeting the following two central criteria:

   a. Obligatoriness: every lexical word has at least one syllable marked for the highest degree of metrical prominence (primary stress);
   b. Culminativity: every lexical word has at most one syllable marked for the highest degree of metrical prominence.

Hyman contrasts this definition to the definition of the HEAD(PWd) constraint, 'which says that each phonological word must have a unique head and therefore exactly one accent' (McCarthy, 2002, p. 78). HEAD(PWd) joins obligatoriness and culminativity together. Hyman presents arguments in favour of a separate OBLIGATORYHEAD (OBLHEAD) constraint and states that obligatoriness plays a special role in stress languages as opposed to tone or pitch-accent languages, namely: no stress language violates obligatoriness, which therefore can be seen as one of the defining typological properties of stress systems.

Given the above criteria of a stress system, Belarusian and e.g. Polish would be both correctly classified as 'stress languages.' However, this typological classification, justified as it may be, provides the learner with little useful information. Nothing in the system of Polish, Dutch or another stress language with (mostly) surface-predictable, metrically determined stress will alert a student of Belarusian to the possibility of free stress, metrically unmotivated stress shifts within paradigms, and the phonetic and phonological enhancement of the immediately pretonic syllable. Surface unpredictability of the locus of prominence, while being atypical of stress systems, is one of the recurrent properties of ***pitch-accent*** systems. This is true of Japanese, Serbo-Croatian, Lithuanian, and Late Proto-Indo-European alike. Of course, systems exist where the location, if not the melody, of lexical pitch-accent[1] is predictable. For example, Zadeh *et al.* (2011) report that Persian word-final stress is in fact word-final pitch accent. Pitch contrast in tonal dialects of West and Scandinavian Germanic is limited to stressed syllables (Gussenhoven, 2004; Hermans, 1999). In Japanese verbs, the location of a pitch-accent is predictable, but its presence is not; in nouns, neither the location nor presence of an accent is predictable (Haraguchi, 1999).

Pitch-accent systems with unpredictable locus of lexical pitch share this property with free-stress systems. Other features in common include the accentual dominance/recessiveness of affixes, which is present in Japanese and East Slavic and has been reconstructed for Into-European. The leftward spreading of high tone from the accented position in Japanese (unbounded) and Serbo-Croatian (bounded) reminds the realization of prominence over the stressed and the immediately pretonic syllables in Belarusian and Russian. In Japanese, polysyllabic unaccented words, when pronounced in isolation, are indistinguishable from words with a final accent, as both receive a word-final high tone. In many analyses of Russian, unaccented words receive a word-initial stress, just like words with an underlying initial accent. Except for the unbounded character of high tone spreading and the word-final rather than word-initial marking of unaccented words, the only essential difference between the accentual systems of Japanese and East Slavic so described is the actual phonetic realization of prominence[2] (stress versus pitch). One can argue that, for the learner of a system like Belarusian, it is

[1] As opposed to intonational pitch-accent.

[2] A reviewer has pointed out that the applicability of the term 'prominence' to Japanese pitch-accent is questionable. On the other hand, Shinohara (2000) reports that the place of lexical pitch-accent in Japanese borrowings from English generally corresponds to the locus of primary stress in the source language, which suggests an affinity between the two phenomena.

more important to capture the mechanisms of establishing the locus of prominence than to be able to reproduce its phonetic expression. From this point of view, the difference between Polish or Hungarian metrically-determined prominence and East Slavic or Japanese lexically-determined prominence is more essential than the issue of whether prominence is realized as pitch (as in Common Slavic or Japanese) or as any of the possible stress cues or combinations thereof. This is something that the traditional typology of prominence systems either misses altogether or marginalizes.

It comes as no surprise that stress systems with surface-unpredictable stress can often be traced back to earlier pitch-accent systems. In fact, Dybo *et al*. (1978, p. 18) put forward the hypothesis that all paradigmatic stress systems[3] are reflections of tonal systems. According to them, at the initial stage of such systems, tonal oppositions are 'relevant for every syllable.' At the next stage, 'tonal oppositions become relevant only on the stressed syllable.' Finally, tonal oppositions are lost, 'giving rise to a "pure" system of paradigmatic accent.'

Late Common Slavic, the last evolutionary step leading to the emergence of modern Slavic languages, was a pitch-accent system (Dybo, 1981; Stang, 1965; Zaliznjak, 1985). According to Jakobson (1963), in Common Slavic, words without an underlying accent could remain toneless in connected speech (he refers to such words is *enclinomena*).[4] That is to say, high tone in Common Slavic was culminative but not obligatory. Under Hyman's criteria of stress systems, this violation of obligatoriness automatically excludes Common Slavic from the group of stress languages. Early East Slavic was also a pitch-accent system with *enclinomena*. Zaliznyak (1985) dates the replacement of pitch for stress in Russian dialects around the XIV century. Word forms that used to be *enclinomena* received obligatory word-initial stress. In terms of Hyman's typology, East Slavic, formerly a pitch-accent system, became a stress system with obligatory word ictus. Crucially, this process was not accompanied by any catastrophic or even significant shifts of the loci of prominence.

Before moving on, we would like to briefly discuss the status of pitch-accent languages in the prosodic typology. One possible definition of the tem can be inferred from Zanten and Dol (2010, p. 120), who define pitch-accent systems as 'systems in which

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[3] According to their classification, Russian is a paradigmatic stress system. In such a system, any given word follows one of the several stress paradigms available in the language.

[4] When forming a separate prosodic word (e.g. in isolation), an unaccented word received a word-initial high tone, so the left edge of such a word was marked by a falling pitch contour (traditionally referred to as 'circumflex').

one syllable is more prominent than the other syllables in the same word, a prominence that is achieved by means of pitch.' Despite numerous attempts to determine the distinguishing characteristics of pitch-accent languages (e.g. McCawley, 1978), there is no agreement as to whether they form a class distinct from tone languages. As pointed out by van der Hulst (2011), the answer depends on how one defines tone and, in particular, whether non-distinctive lexical pitch is analyzed as a realization of phonological tone. His standpoint ultimately is that all languages with privative tone could be analyzed by the use of accents, provided that an accent – unlike stress – does not necessarily have to be culminative and obligatory. In much of recent literature on tone, the opposite view is taken. A tone language is defined as 'one in which an indication of pitch enters into the lexical realization of at least some morphemes' (Hyman, 2006, p. 229); this definition does not require pitch to be distinctive. Now any pitch-accent language can be viewed as a special case of restricted tone languages[5] (Gussenhoven, 2004; Hyman, 2006; Yip, 2002). In fact, the expression 'pitch-accent language' itself is sometimes avoided, and Gussenhoven (2004) speaks of 'accent languages,' while Yip (2002, p. 258) refers to 'accentual languages' and describes them as follows:

> Accentual languages typically have a lexical contrast between tone and no tone, with each morpheme having a maximum of one tone or tonal complex whose location must be lexically specified, and even morphologically complex words often allowing only one tone to surface.

Languages of this kind are generally analyzed in two ways. One is based on diacritic marking, the other presupposes underlying tones, as explained by Yip (*ibidem*):

> One tradition identifies accented syllables with a diacritic mark, usually an asterisk, posits various rules that insert and delete asterisks, and then assigns tones at the end of the phonology to any surviving asterisks. This makes accentual languages look like stress languages […]. The other, more recent, approach is to posit underlying tones instead of asterisks, and have the phonology operate directly on a tonal representation. […] This makes accentual languages look like tone languages, albeit ones of a fairly impoverished sort.

The 'asterisk approach' to the analysis of pitch-accent systems is, of course, the same one that we see in Melvold (1990) and Halle (1997) as applied to free stress, which could warrant the extension of the term 'accentual languages' to free-stress as well as

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[5] In *unrestricted* tone systems, tones are 'distinctive on all syllables' (Hulst, 2011); the term 'restricted tone' seems to refer to tone systems without this property.

pitch-accent systems. On the other hand, the possibility of a tonal analysis apparently severs pitch-accent languages from all stress languages, including those with free stress. Referring to pitch-accent systems like Tokyo Japanese, Somali, Western Basque, etc., Hyman (2006, p. 238) remarks:

> It is significant that these systems […] are as easily analyzed in strictly tonal terms – an option which is not available in the case of such S[tress] A[ccent] languages as English, Russian and so forth.

It is difficult to disagree that an analysis in strictly tonal terms is hardly feasible for those stress systems in which stress is correlated with syllable weight or is determined by syllable counting, e.g. English, Dutch, Latin, Polish, etc. Such systems, however, have very little in common with Russian, if one takes into account how the location of word ictus is determined rather than how prominence is expressed phonetically. In this thesis, we have demonstrated that free-stress languages lend themselves to tonal analysis just as easily as the pitch-accent languages to which Hyman refers.

Hyman's assertion that pitch-accent languages can be 'analyzed in strictly tonal terms' finds ample substantiation in the literature as well as in the present thesis. In one of the preceding chapters, we have demonstrated that a purely tonal approach can be applied with considerable success to Late Proto-Indo-European, reconstructed as a pitch-accent system. While the competing metrical analysis performed in the framework of Optimality Theory requires a number of non-standard solutions or extensions of OT, the strictly tonal analysis we have developed does not require any significant deviations from the standard analysis of tone in OT. At the same time, input representations used in the metrical account are hardly any simpler or less abstract than our tonal representations.

All the pitch-accent languages which received a metrical treatment in Halle (1997) have at various points been analyzed in tonal terms: Lithuanian in Blevins (1993), Indo-European in the present work, and Serbo-Croatian in Inkelas & Zec (1988) and Zec (1993, 1999). Serbo-Croatian is of particular relevance to the analysis of Russian and East Slavic in general. Citing Browne & McCawley (1965), Halle (1997, p. 286) writes that 'the Serbo-Croatian accentual system is essentially identical with that of Russian. In particular, the underlying representations of many Serbo-Croatian words are identical with those of their cognates in Russian.' Next, he shows that 'the location of the word stress is computed by means of a set of rules identical to those [...] for Russian' (p. 287). Recall that, in Halle's metrical model, underlying 'accents' in Russian and Serbo-

Croatian are represented as brackets which either precede or follow a potential nucleus. In an earlier work, Halle (1971) employs the feature [±H], which is assigned on a morpheme-specific basis and corresponds to high pitch, and whose location in a word determines the place of stress. Zec (1993) analyzes Serbo-Croatian accented morphemes as containing an underlying high tone, while unaccented morphemes are underlyingly toneless. In her analysis, the calculation of word prominence is performed in tonal terms. If Browne & McCawley are right that the accentual systems of Russian and Serbo-Croatian are essentially identical, then a similar tone-based solution should be available for Russian, contrary to what is affirmed in the above quotation from Hyman (2006). Indeed, in this thesis, we have outlined a tonal analysis of Belarusian, a language closely related to Russian.

Returning to East Slavic at its pitch-accent stage of development, there is no reason to believe that it would elude a tonal analysis. Now, if the location of prominence in Early East Slavic was determined in terms of tonal representations and mechanisms, then the fact that no significant accent shifts accompanied the loss of surface pitch-accent and the emergence of stress allows one to speculate that the accentual representations and mechanisms remained tonal in nature. The alternative hypothesis would be that tonal representations were replaced e.g. by diacritic marks in the input and by metrical structure in the output, and that tonal processes were replaced by metrical ones – and all this without any major impact on the loci of prominence. While possible as a theoretical construct, this kind of massive restructuring of underlying representations and the replacement of tonal processes by metrical ones, ultimately resulting in a purely phonetic change related to the expression of word prominence as stress rather than pitch and some minor readjustments like the introduction of obligatoriness, does not seem to be a very likely development.

The striking similarities between Russian and Serbo-Croatian referred to by Halle; the unperturbed transition from the pitch-accent stage of East Slavic to its stress stage; the parallel between the Serbo-Croatian high tone spreading and the East Slavic enhancement of the immediately pretonic syllable – are all exhibitive of a fundamental representational and processing affinity of free stress and pitch-accent (that is to say, restricted tone). Considerations of this nature prompted us to perform a non-metrical, feature-based analysis of a modern East Slavic stress system. In our investigation of the accentuation of non-derived nouns in Belarusian, we replaced the underlying accents, asterisks, brackets and other types of diacritic marking used in metrical accounts with an autosegmental feature and hypothesized that the behaviour of this feature can be ex-

pressed in tonal terms. The phonological operations that can be performed on this feature are the standard operations on tone: linking, delinking, spreading, and so on. The resulting analysis proved to be surprisingly straightforward.

In addition, a tonal analysis of Belarusian stress allows for a feasible account of the special status of the immediately pretonic syllable. From the metrical perspective, the fact that it is the second longest syllable in a word seems to be an exotic, if not implausible, phenomenon. After all, in many stress systems, the immediately pretonic syllable is one of the weakest ones, often prone not only to reduction but also to elision. In Russian, on the other hand, vowels that normally undergo qualitative and quantitative reduction to schwa in unstressed syllables are only slightly centralized in the immediately pretonic syllable: they are subject to neutralization but not reduction. This is not what we expect of a typical stress system. As Hyman and Schuh (1974) point out, 'a syllable marked for stress will typically "rob" neighbouring syllables of any stress they may have.' On the other hand, 'a syllable marked by high tone will typically cause surrounding nonhigh tone syllables to assimilate and raise their pitch' (*ibidem*), which brings to mind the peculiar behaviour of the immediately pretonic syllable in Belarusian and Russian. Under a tonal analysis of free stress, the realization of prominence over two neighbouring syllables can be expressed as a rather trivial feature-spreading operation typical of tonal systems.

A solution where tonally determined prominence is realized by means of stress cues may initially seem highly abstract, since it presupposes that the phonetic realization of phonological tone does not necessarily involve pitch. Here we would like to point out that metrically determined prominence also lacks a universal phonetic correlate. Thus, systems exist in which a position that is best described in metrical terms is signalled by pitch. In the Noon language, high tone is invariably assigned to the penultimate syllable. Interestingly, tone in this language may or may not coincide with stress, which is either penultimate or antepenultimate (Soukka, 2000) – therefore, as Downing (2004) puts it, 'pitch and stress are independent in this language.' In Nubi, high tone is not only culminative, but also metrically bound and, crucially, obligatory (Gussenhoven, 2006); for all intents and purposes, it is a stress-accent system without stress.[6] In view of facts like those of Nubi, one would not be well-advised to exclude *a priori* the existence of

[6] *Cf*. Bishop (2002).

systems in which prominence is encoded and determined tonally but realized with phonetic cues that are typical of stress.

6.2 Implications of the tonal analysis of free stress for the typology of prosodic systems

As we have seen, the traditional division of prosodic systems into stress systems and pitch-accent systems is no longer taken for granted, as the very existence of a definable group of pitch-accent languages is actively contested. In addition, as we have argued, this division is quite uninformative, since it implies some essential similarity between stress systems like Belarusian and Polish. If one considers how the location of word ictus is determined rather than how it is expressed phonetically, Belarusian stress arguably shows more affinity with Japanese pitch-accent or with highly restricted tone in some Bantu systems.

The precariousness of the traditional stress *versus* pitch-accent typology is further illustrated by Standard Czech. The language has been regularly cited in the literature as the flagship of word-initial stress systems. When collecting material for this thesis, we listened to several hours of recordings of Standard Czech speech produced in formal situations. Initially, we ascribed our consistent inability to perceive word-initial stress in Czech to its presumable expiratory weakness remarked upon by Jakobson (1923) and to possible perceptual prejudices conditioned by the prosody of our native system. It turns out, however, that phoneticians have generally found Czech stress quite elusive. Bespalova (1989) sums up the existing acoustic research in the following manner: 'As far as Czech stress is concerned, the acoustic approach has not revealed any regularities in its realization.'[7] On the other hand, she confirms Rigault's (1972) observation that the initial syllable in Czech is pronounced at a lower pitch than other syllables. Duběda and Votrubec (2005) report that there is no increase of intensity on the presumably stressed initial syllable and that segmental and durational differences between stressed and unstressed syllables are negligible. They confirm that the fundamental frequency is the most reliable correlate of stress in Czech. Specifically, 'the stressed syllable frequently has a low tone, followed by a rise on the next syllable' (Duběda, 2006, p. 309). A more detailed description of the conditions under which the pitch peak is realized on the second syllable is presented in Bartels (1995). According to her, the peak is realized on

[7] Translation from Russian is ours – A. D.

the second syllable if the first vowel is short and low. In addition, she reports that the initial syllable generally maintains stress-related properties even when pitch peaks on the second syllable, although the amplitude maximum may shift to the second syllable, if long.

Given the fact that Czech nuclei can be long as well as short, it is unlikely that Duběda's (2006) description of the pitch movement as rising on the second syllable applies to words with long initial nuclei. If the left edge is marked with a rising contour, one expects it to peak on the second mora, which may or may not begin the second syllable. The pitch peak is likely to oscillate between the first and the second syllable, depending on the length of the first nucleus and, perhaps, on whether the syllable is closed or open, should coda consonants turn out to be moraic in the language. In this connection, the following fragment from Allen (1973, p. 172) is of interest:

> In Czech, it was noted by Broch (1911, 295 ff.) that the 'stress-wave' tends to extend into the following syllable (or part of it) in the case of words beginning (C)∀CV ~, i.e. with light first syllable ; this contrasts with the types (C)∀CV ~ and (C)∀CCV ~ i.e. with heavy first syllable, where the stress is completed within that syllable. On this situation Broch commented (297) that it is evidently difficult for the stress to be limited to a light first syllable.

Of course, the realization of Broch's 'stress-wave' over two syllables, whenever the first syllable is light, hardly sounds like a typical metrical phenomenon. Rather, it brings to mind the common requirement that a pitch contour be realized over two moras. If his observations are correct, coda consonants in Czech must have been moraic at the beginning of the twentieth century. When discussing the distribution of the pitch peak, Bartels (1995) only refers to the duration and height of nuclei. It is not clear whether this is due to the fact that closed and open syllables with identical nuclei show the same behaviour or perhaps to the omission of the (C)∀CCV environment . Be it as it may, phonetic experiments repeatedly fail to discover any reliable stress cues in Czech, except for (presumably) a rising pitch contour aligned with the left edge of the word. We are forced to conclude that the celebrated word-initial stress in Czech is, in fact, pitch-accent. As we have already mentioned, Zadeh *et al.* (2011) come to the same conclusion with respect to the word-final stress/pitch-accent in Persian.

In view of various problems connected with the phonetically-based division of languages into stress *versus* pitch-accent systems, we suggest that the typology of prosodic systems should be supplemented with another dimension, namely: whether the locus of prominence is determined metrically (or is otherwise predictable) or on the basis of the

accentual properties of particular morphemes encoded in the lexicon (and therefore unpredictable). As a rule, metrically determined prominence is characteristic of stress systems. Pitch-accent languages, being a subgroup of tone languages, are more likely to determine the location of the word ictus in a surface-unpredictable manner, on the basis of the underlying accentual properties of individual morphemes. Even when the location of lexical pitch-accent is predictable, its *occurrence* may not be: in Tokyo Japanese, verbs are either accented on the penultimate mora (predictable location) or unaccented (unpredictable occurrence). Free-stress systems and systems with metrically predictable lexical pitch combine properties of the prototypical stress and tone systems.

Table 6-1: Typology of word prominence

	Phonetic Expression	
	Stress	**Pitch**
Predictable (e.g. metrically determined); prototypically a stress system	Dutch, English, Macedonian, Polish	Czech, Persian
Encoded in the lexicon; prototypically a restricted tone system	Abkhaz, Belarusian, Russian	Common Slavic, Japanese, Lithuanian, Western Basque

Note that systems with lexical pitch-accents at word edges (in the table, Czech and Persian) do not *per se* require the construction of metrical structure, as they can be analyzed in terms of boundary tones (Hyman, 2009). What is important for our typology, is whether or not the location or presence of a pitch-accent is predictable. While we assumed no metrical structure for East Slavic, some systems with surface-unpredictable stress are metrically bound. Modern Greek is such a system: stress is located within the trisyllabic window, but its precise position is surface-unpredictable.

The introduction of an additional dimension into the typology of word prominence, reflecting the way in which the loci of prominence are determined, makes it possible to capture the affinity and universal, as it seems, diachronic relationship between pitch-accent systems and systems with free stress. At the level of analysis, the affinity can be expressed in two competing ways. One is by means of the tonal model of free stress developed in the present work. If this model is adopted, then both pitch-accent and free-stress systems can be analyzed in strictly tonal terms. Alternatively, a model using underlying accents (asterisks, etc.) can be used, if one assumes, following van der Hulst

(2011), that the realization of accents as either stress or pitch is language-specific and perhaps a matter of phonetic implementation. It seems, however, that the two models make different predictions as to what a possible prosodic system is.

It might seem that the idea that diacritic accents are interpreted in a language-specific manner precludes systems which combine free stress with independently and unpredictably assigned lexical pitch-accent. This is indeed so, if accents are culminative; however, van der Hulst (2011) proposes that, unlike stress, accents do not have to be either culminative or obligatory. If his assumption is accepted, then one can conceive of a system which, should two or more accents occur in the input to the phonetic implementation component, assigns stress e.g. to the leftmost accent and pitch to all the others. Moreover, even if one assumes that the phonetic implementation component cannot interpret the same 'objects' differently, the problem is not solved. The point is that the unrestricted nature of diacritical marking does not in principle preclude the splitting of accents into tone accents and stress accents, so that e.g. *T would encode a tone accent and *S – a stress accent. The prediction is that systems could exist which combine free stress with unpredictably assigned tone. Below we argue that a convincing example of such a system is yet to be produced.

On the other hand, if we are correct in our proposal that free stress is universally encoded and processed in tonal terms, then the following strong prediction can be made:

(2) **The Incompatibility of Freedoms Hypothesis**

> No language combines free stress with unpredictable tone. If a language has both stress and tone, only one of them is encoded in the input by means of a morpheme-level feature.

Until the last decades of the twentieth century, the prevailing view was that stress and tone are incompatible in principle. The reason behind this view was that pitch was believed to be one of the most universal, if not ***the*** universal cue for stress. Since then it has become clear that, in most stress languages, pitch is largely irrelevant to stress cuing. On the other hand, there is a considerable number of tone languages which are reported to have stress. In most of these languages, stress is predictable, as it is either fixed or aligned with tone.

The prediction in (2) is a necessary consequence of the tonal model of free stress. Can it be generalized to apply to all systems with contrastive stress, as in (3) below?

(3) No language has both systematically contrastive stress and systematically contrastive tone.

The more general hypothesis in (3) does not logically follow from our tonal model of free stress. While every free-stress system is contrastive, not every system with systematically contrastive stress is a free-stress system. Correspondingly, tonal analysis cannot be automatically extended to all systems with contrastive stress. Several systems have been reported in which stress is assigned in an unpredictable fashion to either the last or the penultimate syllable. In cases like this, stress can be analyzed as calculated metrically, provided that lexicon entries are allowed to contain catalectic or extrametrical syllables. For the generalization in (3) to be invariably true, all systems with contrastive stress should require tonal representation and processing of stress.

Still, the number of systems that violate or apparently violate the generalization in (3) is quite small. One such system is the Caribbean language Papiamentu (also known as Papiamento). As Remijsen (2001) remarks, 'there is compelling minimal-pair evidence that Papiamentu features both lexically contrastive pitch-accent and distinctive lexical stress.' Below we reproduce the table in Remijsen (*op. cit.*, p. 44).

Table 6-2: Minimal set examples of tone and stress contrast in disyllabic words in Papiamentu, after Remijsen (2001)

Stress and Melody	**'High-Low**	**'Low-High**	**Low-'High**
	'múla	'mulá	mu'lá
Gloss	'mule'	'grind' (infinitive)	'grind' (participle)
	'líga	'ligá	li'gá
Gloss	'bond, union'	'bind' (infinitive)	'bind' (participle)
	'débe	'debé	de'bé
Gloss	'debt'	'owe' (infinitive)	'owe' (participle)

As we see, tone serves to contrast words in the first column with those in the second one, while stress serves to contrast words in the second column with those in the third one. However, the data in the table provide no clear evidence that either tone or stress is unpredictable. Whichever contrasting form we take as the base, the other two forms can be derived from it in a straightforward fashion. In fact, at least in this particular piece of data, both stress and tone can be predicted on the basis of the morphological category of

any given word. In particular, final high tone seems to mark verbs, while the distinction in the position of stress in infinitives and participles can be analyzed as resulting from morphologically conditioned catalexis or extrametricality. The role of tone as a morpho-syntactic marker in Papiamentu is discussed in Kouwenberg (2004).

The facts of Papiamentu demonstrate that (3) does not hold for systems where stress and/or tone, despite being contrastive, is predictable; they motivate the following refined version of the generalization in (3):

(4) No language has both systematically contrastive stress and systematically contrastive tone, unless at least one of them is predictable.

The considerably relaxed generalization in (4) is apparently contradicted by Ma'ya, an Austronesian language. Under the analysis in Remijsen (2001), the language has both contrastive tone and contrastive stress, neither of which is predictable. In an earlier analysis by van der Leeden (1993), stress in content words is invariably final and coincides with the locus of tone contrast. Therefore, the only unpredictable element is the tonal melody realized on the stressed syllable. Obviously, van der Leeden's account is fully compatible with the generalization in (3), as he describes Ma'ya stress as non-contrastive.

In the analysis proposed by Remijsen, the number of tonal contrasts is reduced, while stress is described as either final or penultimate. If he is right, then tone and stress in Ma'ya are not only independently contrastive but also unpredictable, which falsifies the generalization in (3) as well as its weaker version in (4). However, even under Remijsen's analysis, evidence from Ma'ya does not necessarily contradict the Incompatibility of Freedoms Hypothesis in (2). If stress in this language is indeed confined to the final and penultimate positions, it can be analyzed in metrical terms by means of catalexis or extrametricality specified in the lexicon. Correspondingly, tonal representations are reserved for the encoding of contrastive tonal melodies. According to Zanten & Dol (2010), the prosodic systems of two Papuan languages, Kaure and Wahgi, resemble that of Ma'ya.

To better understand our hypothesis about the incompatibility of free stress and unpredictable tone within one system, let us imagine the following language. The input of any single morpheme in this hypothetical language can have one of its stress-bearing units marked with an accent. When several morphemes are concatenated in a word, the rightmost accented stress-bearing unit is chosen as the location of word stress. If none of

the morphemes contains an accent, stress is word-final. In the same language, the input of each morpheme may contain at most one instance of high tone (H). When several morphemes are concatenated, the rightmost morpheme with an underlying H realizes its tone on the source morpheme. When no morpheme contains a high tone in the input, the word remains toneless. This relatively straightforward system has one big problem: nothing like it has ever been attested in a natural language. Of course, one cannot exclude that the lack of this kind of systems in the inventory of known prosodic systems is due to the fact that, as de Lacy (2007) reminds us, many existing descriptions of stress are subjective and flawed. So far, however, free stress and unpredictable tone have never been reported for the same language. Under the restrictive tonal model of free stress proposed in the present thesis, it is expected that free stress cannot co-occur with unpredictable tone in principle due to the identical nature of their input representation.

6.3 Tone and vowel duration

In our analysis of Belarusian and Slovak, we essentially propose that phonological tone in both languages is ultimately realized as duration. The existence of an interrelationship between 'real' tone and vowel duration is well established, albeit not always straightforward. In terms of perception, syllables with higher fundamental frequency (f_0) are perceived as longer than syllables with lower f_0 (Yu, 2010). In terms of production, however, 'all else being equal, vowels on low tone are longer than those on high tone' (*op.cit.*, p. 151). As far as contour tones are concerned, vowels on contour tones are longer than vowels on flat tones (*ibid.*); moreover, they are perceived as longer when the actual duration is equal (Cumming, 2011), even though this latter property of perception may be language-specific (Lehnert-LeHouillier, 2007; Takiguchi, Takeyasu, & Giriko, 2010). Among contour tones, vowels bearing rising tones are longer than vowels with falling tones (Gandour, 1977). This may be connected with the articulatory fact that, as reported in Ohala and Ewan (1973), upward pitch changes take longer than downward pitch changes. Also according to Xu and Sun (2002), the maximum speed of a downward pitch change is higher than the maximum speed for an upward change. Gordon (2001) proposes the following hierarchy of the ability to bear contour tone: long vowels; syllables containing a short vowel plus a sonorant coda; syllables containing a short vowel plus an obstruent coda; open syllables containing a short vowel.

Given the above correlations and regularities, one cannot but expect to see lexical tone being enhanced by duration or reanalyzed as duration.[8] Gandour (1977, pp. 57-58) makes the following generalizations concerning diachronic vowel lengthening and shortening in Thai dialects:

> In the Chiang Rai dialect short non-low vowels have become long under *rising* tones, long non-low vowels have become short under *nonrising* tones. […] In the Phuket dialect long non-low vowels have become short under *falling* tones, all short vowels have become long under *nonfalling* tones.

Most studies of the historical phonology of Slavic posit a correspondence between the lexical pitch melody of Late Common Slavic and the duration of root vowels in Modern Czech (Dybo, 2000; Feldstein, 1975; Kapović, 2005; Shevelov, 1964; Skljarenko, 1998). Namely, the original long vowels were shortened if they bore a falling pitch contour (initial vowels of *enclinomena*), while vowels bearing a rising contour were lengthened or retained their original length. Without prejudice to the accuracy of this generalization (see Scheer, 2003 for an alternative account of some cases of vowel length distribution in Czech), one must admit that typologically it is quite plausible. A pattern where the falling tone is reflected as shortness and the rising tone as length would be analogous to the Chiang Rai pattern.

The development of contrastive length in Korean is discussed in Kwon (2003). One of the regular sources of modern length is historical tone. Modern standard Korean lacks lexical tone but has developed contrastive length. The tonal system of Middle Korean had three tonal melodies: high, low, and rising. Subject to various limitations, vowels that originally bore a rising tone, have acquired length. Other cases of vowel length are independent from tone, so the two level tones are not a factor in the development of length. Here a tentative parallel can be drawn with the reflexes of Late Common Slavic pitch-accents in modern East Slavic languages. The melodies of the culminative pitch-accent of Common Slavic were contours: falling and rising.[9] *Mutatis mutandis*, the location of stress in East Slavic often corresponds to the location of pitch-accents in Late Common Slavic. Vowel duration, being the predominant stress cue, is therefore the ultimate phonetic reflex of Common Slavic pitch contours.

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[8] Most of the examples have been located thanks to the references in Yu (2010).

[9] Dybo *et al.* (1990) suggest that the rising tone which shifted from short endings at a late stage in the development of Common Slavic (the so called neo-acute) became a fall-rise, an even more complex contour.

An interesting synchronic example of tone being reanalyzed as duration comes from West Germanic tonal dialects. Verhoeven (1992) examines the Dutch dialect of Weert and comes to the conclusion that there is a contrast between two lexical pitch melodies. The contrast consists not so much in the pitch configuration as in its alignment within the stressed syllable. In her turn, Heijmans (2002) argues that the alleged tonal contrasts in Weert are in fact durational contracts. Short vowels correspond to the purported Accent 1, while long vowels correspond to Accent 2. She compares this dialect to a neighbouring dialect with unquestioned tonal contrast and shows that there is a good correspondence between vowel length in Weert and pitch melody in the tonal dialect. One of the interpretations she suggests is that the dialect of Weert has reanalyzed tonal contrast in terms of vowel length. Verhoeven (2002) confirms his earlier observations on the alignment of pitch in Weert, but acknowledges that a durational interpretation is feasible.

The direction of diachronic change may also be from contrastive length to contrastive tone. Svantesson (1991) reports on a fascinating case of tonogenesis. Hu, a Mon-Khmer language from the Palaungic branch, has developed 'a two-tone system where the tones are not the reflexes of voiced/voiceless proto-initials, as is most often the case in Mon-Khmer two-tone (or two-register) languages. Instead, the tones are the reflexes of the long/short vowel opposition which existed in Proto-Palaungic (inherited from Proto-Mon-Khmer)' (Svantesson, 1991, p. 67). Specifically, 'long vowels have acquired low tone and short vowels high tone' (*op. cit.*, p. 76). This development might seem unexpected in view of the phonetics of tone perception but it is compatible with the phonetics of tone production (see the beginning of this section for a short review of correlations between tone and duration). Currently, vowel length is non-distinctive in the language.

6.4 Are there glottal accent systems, or How abstract is tone?

Hyman (2006) briefly discusses Cuzco Quechua, in which glottalized and aspirated consonants have the following peculiar properties: they may occur only in roots; at most one such consonant may occur per root, and then always in an onset and as close to the left edge as possible. Considering these accent-like properties of glottality and aspiration in this language, Hyman poses the following question: 'On the basis of its culminative nature and the restriction of glottality to prominent positions (roots, onsets), should one conclude that Cuzco Quechua is a 'glottal accent' (GA) language?' (*op. cit.*, p. 239). He answers the question in the negative. According to him, an argument against the 'glottal

accent' interpretation of Cuzco Quechua is that the language has an independent stress-accent system, namely: penultimate stress. The assumption here seems to be either that no language can combine two prosodic systems or that features docked to consonants cannot express prominence. In the same paper, however, we see numerous examples of systems that combine syntagmatically contrasted or plainly culminative tone with stress. In fact, the peculiar distribution of laryngealized stops in Cuzco Quechua reminds a Bantu-type tone system in more than one way.

First of all, as Parker (1997) remarks, laryngealization in this language is characteristic of entire roots rather than individual phonemes. A similar statement would be true with respect to tone and morphemes in many Bantu languages or 'accent' and morphemes in East Slavic. Parker's observation is strengthened by the fact that there is no voiced/voiceless opposition in the language, so obstruents are not contrasted by any laryngeal feature. Parker & Weber (1996) propose that the features [constricted glottis] and [spread glottis] are floating autosegments which dock to the leftmost onset stop in the root. Now, in some languages, for example English, [constricted glottis] is the feature which distinguishes 'voiceless' consonants from the 'voiced' ones. The role of the voiced/voiceless opposition in tonogenesis is well recognized. Although the relationship between the voicing of consonants and tone is usually analyzed with a different set of laryngeal features, namely [stiff vocal cords] *versus* [slack vocal cords], the feature [constricted glottis] is known to interact with tone, too. Schuh (1978) reports that in Bade, a Chadic tone language, H-spreading is blocked by non-glottalized voiced obstruents but not by glottalized voiced obstruents. In Ngizim, a related language, L-spreading is blocked by voiceless and glottalized voiced obstruents. It is clear that [constricted glottis] can interact with tone. Now, if we take the system of Cuzco Quechua and replace [constricted glottis] and [spread glottis] with another set of laryngeal features, i.e. [stiff vocal cords] and [slack vocal cords], and make them dock to the leftmost TBU, we shall produce a rather unremarkable restricted tone system with non-obligatory culminative tone aligned with the left edge. Indeed, with a stretch of imagination, Cuzco Quechua itself can be analyzed as a language in which underlying tones are docked to the syllable node and are realized phonetically on the respective onset obstruents as either aspiration (low tone) or glottalization (high tone).

Hyman's rhetorical question as to whether one can classify Cuzco Quechua as a 'glottal accent' language is posed in the context of his well-founded critique of the validity of the traditional 'pitch-accent' class in the typology of prominence. While we

do not dissent with his argumentation against such a class, we think that an informal answer to the above question could be that a 'glottal accent' is neither more nor less valid a class than any 'laryngeal' accent, e.g. a tone/pitch accent. Both can be seen as expressions of prominence encoded in the input as opposed to prominence established by purely metrical means or otherwise predictable. This opposition has often been marginalized in typological discussions, their focus being on how the locus of prominence is *expressed* rather than on how it is *determined*.

In this work, we have demonstrated that tonal analysis can be applied with considerable success to such apparently disparate phenomena as East Slavic stress, Indo-European pitch-accent, Slovak length, and laryngealization in Cuzco Quechua. The inevitable implication is that tone, just like stress, does not have a unique phonetic correspondent. It is a much more abstract and therefore a much more widespread feature than usually believed. In this respect, our results confirm Lockwood's (1983) proposal that pitch is not the only possible phonetic expression of phonological tone. There is one important difference, though: Lockwood explicitly requires that tone be non-culminative, which precludes the possibility of a tonal analysis of pitch-accent systems, let alone free-stress systems. Given the non-culminativity requirement, systems with culminative pitch must be analyzed in terms of accents rather than phonological tone. However, in the light of recent discussions in the literature, the non-culminativity condition for tonal analysis appears unwarranted, as does the assumption that culminativity is tantamount to accent. On the one hand, Hyman (2006, *inter alia*) acknowledges that tone may be not only culminative but also obligatory; on the other hand, van der Hulst (2011) suggests that accents do not have to be either culminative or obligatory. This blurring of boundaries between tone and accent is clearly evident in Revithiadou's (1999) proposal of an accent feature. The feature, described as 'tone-like,' can be either strong (realized as high pitch or the head of a foot) or weak (realized as low pitch or the tail of a foot). Now phonology has to accommodate two tone-like features: accent and tone proper, both of which can be realized as pitch. Our model, in which accents have been replaced by tone, is more economical without being more abstract.

The recurrent typological and diachronic affinity between free stress and tone prompted Dybo (1989) to advocate the need for a unified prosodic theory which would bring accentology (study of stress) and tonology together. Although this desideratum was expressed in the specific context of historical linguistics and language reconstruc-

tion, it may well prove relevant for research on modern systems. The present thesis is a step in this direction.

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Samenvatting

Dit proefschrift betoogt dat een strikt tonale analyse, in plaats van een accent analyse, toepasbaar is op een veel breder scala van suprasegmentele verschijnselen dan tot dusverre is aangenomen. Het is grotendeels gewijd aan klemtoon in Oost Slavische talen. Een tonale analyse van klemtoon in het Wit-Russisch wordt uiteengezet die sterk afwijkt van bestaande analyses van het Russisch, met name de OT (Optimaliteits theorie) analyses van Alderete (1999) en Revithiadou (1999). Het hier ontwikkelde tonale model kan op een succesvolle manier dezelfde data verantwoorden als de accent gebaseerde benaderingen.

Het eerste belangrijke resultaat van het voorgestelde model ligt op het gebied van de typologie van woord prominentie: in tegenstelling tot Hyman (2006), laten we zien dat talen zoals het Russisch zich juist wel uitstekend lenen voor een analyse in puur tonale termen als men aanneemt (van der Hulst 1999), dat de fonetische expressie van fonologische toon anders kan zijn dan alleen pitch (Lockwood 1983).

Een tweede belangrijk resultaat is theorie-intern. Voor de analyse van Alderete (1999) zijn transderivationele anti-faithfulness constraints nodig waarbij, en dat is controversieel, output-output correspondenties nodig zijn tussen woorden die wel morfologisch gerelateerd zijn, maar die niet morfologisch afgeleid zijn. Bovendien moeten morfemen die tot anti-faithfulness leiden daar diakritisch voor gemarkeerd worden. Revithiadou's (1999) analyse leunt zwaar op een hele serie van positionele faithfulness constraints en op het voorstel -waarvan we zullen laten zien dat het incorrect is- dat het klemtoon gedrag van een morfeem afhankelijk is of het al dan niet het morfologisch hoofd van een woord is.

De aanname van een tonale representatie leidt tot een sterk vereenvoudigde beschrijving. De door ons voorgestelde analyse gebruikt alleen de meest basale input-output correspondentie mechanismes en alleen standaard constraints. Er zijn geen constraints nodig die lexicaal gemarkeerd zijn, en, met uitzondering van morfeem grenzen, wordt er niet naar morfologie verwezen.

Een derde belangrijk resultaat van de tonale analyse is dat accent dominantie niet langer opgevat hoeft te worden als een diakritisch kenmerk van een morfeem. We

beargumenteren dat het verschil in accent gedrag van geaccentueerde dominante en recessieve suffixen rechtstreeks volgt uit het verschil in de status van de onderliggende hoge toon: de input van een dominant suffix bevat een geassocieerde toon, de input van een recessief suffix daarentegen bevat een zwevende toon. Vanwege een conditie tegen het dissociëren van toon is een geassocieerde toon intrinsiek meer stabiel: deletie betekent zowel dissociatie als deletie van toon. Deletie van een zwevende toon behelst alleen deletie van de toon.

Een vierde aantrekkelijk resultaat van onze beschrijving van accentuering in Oost Slavische talen is dat de realisatie van woord prominentie over twee lettergrepen (de beklemtoonde lettergreep en de daaraan voorafgaande lettergreep) nu begrepen kan worden als tonale spreiding, in wezen identiek met anticipatorische hoge toon spreiding in het Serbo-Kroatisch en in sommige Bantu talen.

Naast klemtoon in Oost Slavische talen wordt het door ons ontwikkelde tonale model ook toegepast op Proto-Indo-Europese athematische zelfstandige naamwoorden. We laten zien dat het tonale model dezelfde data kan verantwoorden als de accent analyses van Kim (2002) en Frazier (2006), maar wederom op een sterk vereenvoudigde wijze.

Als laatste wordt het tonale model van woord prominentie toegepast op de distributie van lengte in het Slovaaks. We zullen beargumenteren dat, als lengte tonaal gerepresenteerd is, het verkorten van lange nuclei naast andere lange nuclei beter opgevat kan worden als een OCP effect dan als een metrisch geconditioneerd fenomeen (Mellander 2003). De tonale analyse beschrijft progressieve verkorting (de zogenaamde Ritme Regel) en regressieve verkorting (voor de suffixen *-ár/-iar* en *-ák*) als één en hetzelfde mechanisme: het opheffen van lange nuclei reeksen. In dit opzicht is de hier voorgestelde analyse niet alleen superieur aan de metrische, maar ook aan de cyclische analyse van Rubach (1993). We betogen dat de suffixen *-ár* end *-ák*, die verkorting uitlokken, maar niet ondergaan, in de fonologie van het Slovaaks dezelfde status hebben als de geaccentueerde dominante suffixen in het accentsysteem van Oost Slavische talen.

Het tonale model van vrije klemtoon doet een sterke voorspelling: vrije klemtoon van het Oost Slavische type is onverenigbaar met een lexicale toon waarvan de aanwezigheid en/of melodie onvoorspelbaar is en derhalve in de input gecodeerd moet zijn.